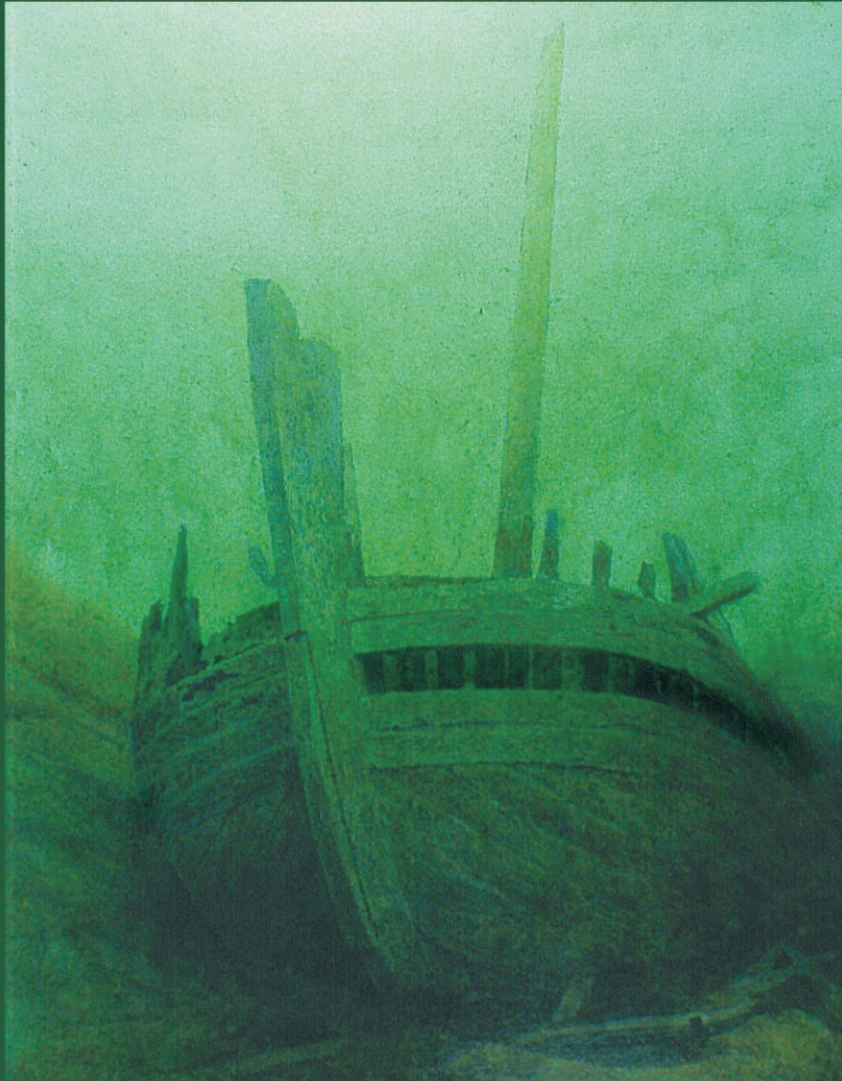


SHIPWRECKS AROUND THE WORLD

Revelations of the Past



Editor

Sila Tripati

Research in maritime archaeology in Portugal: A view of the Past and Present

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Portugal is a country with a secular strategy in overseas expansion, a cultural identity linked to the sea and of a cultural heritage spawning four continents. Thus maritime archaeology has become an essential field to understand the country. Presented here is an overview of the current state of maritime archaeology in Portugal in regard to several projects presently underway in Portugal and their contribution towards Portuguese history and maritime history in general. These occur in diverse fields as coastal knowledge, maritime cultural landscape, coastal archaeology, port studies associated with river and estuary research, ship's studies and history of shipbuilding. Portugal's ties to the sea have a secular origin. The geographic shoreline configuration (800 km of shoreline in a border of 1800 km) and abundant waterways and ports, led to an intense riverside settlement, to the development of maritime related economic activities, to a secular navigation knowledge and, of course, the cognitive construction of an entire magico-religious maritime tradition in the territory of present day Portugal. A country with very early defined borders in the late 13th century, Portugal secularly adopted overseas expansion as a main strategy. Its interventions in Africa, America and Asia tried to balance a lack of European expression, enabling a fragile political, economic and even cultural independence. Thus, Portuguese historiography has always privileged the discoveries and overseas expansion historic period, focusing on it in search of answers to the national successes and failures in either nationalistic or unnationalistic spectrum. After the revolution on 25 April 1974 (starting democracy) research in Portugal's maritime dimension had a more serene environment and began to study other periods of Portuguese history. At this time also an entire range of unexplored sources were utilized in a consistent manner. This process led to the institution of archaeology in Portugal. Maritime archaeology was also belatedly institutionalized. Its progress has occurred principally in the latest decades. However it, made an undeniable contribution to several never before fully explored problematic, only addressed by traditional historiography, based upon written documents. This new field was important for the modern age studies, especially the overseas expansion period, but also added new data related to the roman period and others. In this text we sketch an abbreviated picture of the introduction period of this discipline in Portugal, characterizing mainly the currently ongoing collective projects in Portugal. Omissions or lapses are possible in a text that represents a group vision with largely diverse experiences in this field, but we hope presently to build a common approach, always in diversity.

The past

Portuguese maritime archaeology history until 2002 has been explained in detail by Jean-Yves Blot (2002). In his article the author explains not only the development of the field in Portugal, but also puts in a maritime, economic and geologic perspective nautical finds in Portugal from Roman times to the 18th century (Blot, 2002: 466-82). Francisco Alves also published two articles on the history of underwater archaeology, dividing it into three periods (Alves, 1990; Alves, 2002). We will review the events we consider pertinent to the understanding of the history of nautical archaeology in Portugal to put current projects in perspective.

From the early years to the institutionalization

The development of nautical research in Portugal is attributed to Lixa Filgueiras' ethnographic work. In 1985 he organised the first Portuguese boat international symposium (Filgueiras, 1988; Blot, 2002: 484). 20 years later his work was honoured and synthesised (Garrido and Alves, 2009). However, several years passed before nautical archaeology research became established in Portugal. In the 1980s research was done by individuals without any legal framework (Blot, 2002: 483; Alves, 2002: 256-258). After the pioneering effort in *San Pedro de Alcantara* wreck site, an 18th century Spanish vessel lost off the Portuguese coast near Peniche (Blot and Blot, 1991), and in *Océan* project, an 18th century French vessel from the Seven Years War lost in Praia da Salema (Alves, 1997a), most of the research in nautical archaeology was done within the purview of the *Museu Nacional de Arqueologia* (MNA, National Museum of Archaeology). Its director Francisco Alves and a group of close collaborators worked on several projects and made a number of short interventions in the field (Alves, 2002: 258). Also in the 1990s, occurred the creation of *Arqueonautica*, a non-profit research association, presided over by Francisco Alves, responsible for the first short courses in underwater archaeology and the first underwater cultural heritage itinerary on the *Océan* wreck (Alves, 1992: 455-467). The Museum of the sea of Cascais was also a pioneer in underwater heritage preservation from the mid 20th century. Initially, activities concentrated on prospecting actions along the Portuguese coast, especially in the Sado and Tagus estuaries, led to the collection of one of the most voluminous sets of Roman period and Modern Age artefacts existing then in Portugal. Since 1980 the museum decline caused parts of the collection to be transferred to other institutions, such as the MNA (Alves, 2002: 257).

In 1997 underwater archaeology becomes institutionalized by the creation of *Centro Nacional de Arqueologia Náutica e Subaquática* (CNANS, National Centre for Nautical and Underwater Archaeology), under the newly created *Instituto Português de Arqueologia* (IPA, Portuguese Institute of Archaeology). At this time new legislation was also drafted promoting underwater archaeology as a scientific endeavour, inverting the previous tendency

for commercial exploitation of underwater cultural heritage. CNANS became responsible for the national underwater cultural heritage database, and for the management of fortuitous discoveries in Portugal. Several finds studied by CNANS allowed in 1998 by the organization of the *International Symposium on Iberian Shipbuilding* (Alves, 2001). The presentation of five wrecks of Iberian-Atlantic tradition and the discussion of the meaning of Iberian-Atlantic typology, as proposed by Oertling (2001; 2005), marked the scientific debate for years. Coincident was the launching of the rebuilt 1800 tons frigate *Dom Fernando II e Glória*. This vessel was one of the few Portuguese historical vessels built in India in the 19th century and lost due to a fire in 1963, sinking into the Tagus River (Leitão and Simões, 2002). Recovered in 1988 and re-launched in 1997, it was one of the highlights of the world's Expo98 Lisbon. In present times it's a museum representative of the Portuguese Navy of the period and in Blot's (2002: 487) opinion 'a giant exercise in a dying knowledge [of wooden shipbuilding] now recorded in wood'.

CNANS hegemony and nadir

By the year 2000, research in maritime archaeology was mostly under the scope of CNANS which also had duties in cultural heritage management. Noteworthy are Ria de Aveiro A, the shipwreck remains and ceramic cargo of a 15th century Iberian vessel (Alves et al., 2001a), Corpo Santo, stern section of a 14th century vessel (Alves et al., 2001b), Cais do Sodré, the remains of a 15th century ship (Rodrigues et al., 2001), Angra C, probably a Dutch vessel, and Angra D, an Iberian vessel, both located in Angra do Heroísmo bay (Garcia et al., 1999; Garcia and Monteiro, 2001) and Faro A, the shipwreck remains of a 17th century English merchantman (Blot et al., 2005). Some of this research is being currently revisited. Of a wider scope, were underwater cultural heritage survey projects as ProArade, which resulted in the find of the early modern vessel Arade 1 (Alves et al., 2002; Rambelli et al., 2003; Loureiro and Alves, 2008), and the survey of São Julião da Barra, where the probable Portuguese Indiamen *Nossa Senhora dos Mártires* (Castro, 2002a) was located. CNANS had also several international participations regarding projects and study groups. Under CNANS were done the first remote sensing surveys for underwater cultural heritage (Pinheiro et al., 1998; Blot et al., 2005). In the scope of de Ria de Aveiro A project, several analyses were also conducted by Universidade de Aveiro, regarding the ship's cargo: X-ray diffraction, scanning electron microscopy - energy dispersive x-ray spectroscopy (SEM-EDS) and thermal analysis. They also conducted some ballast identification, as well as wooden species identification. The first magnetic survey for the location of nautical heritage was done in *San Pedro de Alcantara* site in the 1980s (Kermorvant et al., 1990). This period saw the development of some standards in the field of nautical archaeology: as the application of Muckleroy (1975; 1978) methodology in Portuguese waters, and the need to work past shipwreck studies in nautical research (Blot, 1999), with the utilization of empty spaces to determine ship's structure and morphology in Faro A wreck (Blot et al., 2005), with the introduction of trilateration methods and web in Portugal (Blot et al., 2005), with the utilization of scanning electron

microscopy for the understanding of wrecking processes at *San Pedro de Alcantara* (Macleod and Schindelholz, 2004) and with the utilization of fuzzy logics mathematics to determine shipwreck dispersal patterns at the roman wreck site of Cortiçais (Blot et al., 2006).

Very few research projects in maritime archaeology were developed outside CNANS direct guidance and almost none connected to academia. This was the case of *Quarteira Submersa* (Simplício and Barros, 1999-2000; Simplício et al., 2002), a project to understand the coastline evolution of a waterway in conjunction with a group of submerged structures from roman times in south Portugal, the *Porto de Mértola* survey project, for the search of cultural heritage in Guadiana's river bed and harbour knowledge (Simplício et al., 1999), *Nossa Senhora da Luz*, a Portuguese Indiamen sunk in Azorean Island of Faial in 1615 (Bettencourt, 2006), and the above mentioned *San Pedro de Alcantara* excavation. These events have led some authors to name with exaggeration this period as a moment of 'state authoritarianism' regarding nautical archaeology research (Infantini and Poloni, 2010). We cannot dismiss CNANS undeniable participation in orientating nautical and underwater research, its primary mission being cultural heritage management. Thus, CNANS hosts a number of volunteers, graduate students and integrates the community in research. Meanwhile, since 1998 cultural heritage surveys and contributions towards management have been developed by local governments and non-profit associations. These projects studied underwater cultural heritage within fields of inquiry about harbour studies, maritime cultural landscape, or city development.

Starting with the project *Safeguarding Underwater Archaeological Heritage in the River Arade - Portimão*, by the non-profit association *Grupo de Estudos Oceânicos* (GEO, Oceanic Studies Group), a systematic visual survey of the river bed resulting in the location of numerous artefacts and seven shipwrecks ranging from roman imperial to late 19th century (Machado, 2001) was developed from 1998 to 2000. Furthermore, in 2006 was created the underwater archaeology team of Portimão municipality, with the mission of chartering and understanding the underwater heritage in Portimão County, including Arade's estuary (Fonseca, 2006). In 2000, Direcção Regional de Cultura (DraC, Regional Directorate of Culture in Azores) took charge of the *Underwater Archaeological Surveys Project of Azores*, from CNANS-INA. Its mission statement was to identify and position shipwreck sites of the Azores archipelago, using historical and oral records in conjunction with systematic surveys (Crisman and Garcia, 2001). Angra was one of the most fruitful areas, confirmed by the location of more than fifteen archaeological sites. However survey was developed also in Pico, Faial, S. Jorge and Flores islands (Garcia, 2005). In 2004 was founded the group for Underwater studies and research (GEPS), a non-profit association based in Peniche, which dedicated itself to the development and support of maritime archaeology until 2010. Its importance lies in the joint work between archaeologists and divers for the study and protection of underwater cultural heritage, raising awareness in the local populations of the significance of such heritage. Projects such as the underwater archaeological surveys of Peniche and Lourinhã counties allowed the start of inventory

programs and coastal zone management. Research projects at the site of Vale de Frades-Lourinhã (Freire and Russo, 2004) or the São Nicolau-Lourinhã, supported by collaboration with CNANS together with Lisboa and Coimbra universities contributed to maritime knowledge (Russo, 2005).

In 2005 starts the *Underwater Heritage Survey Project of the Cascais County* (ProCasc), under the purview of Cascais municipality (Freire et al., 2012a), still ongoing and discussed in the follow section. A year later began the *Underwater Heritage Survey Project of Lagos County* (PCASCL), under the direction of Lagos municipality. This project resulted in the understanding of Lagos' county maritime interface from the late Iron Age to the 19th century, including five wrecks and numerous isolated artefacts (Fraga et al., 2008). With the downgrading of CNANS in 2007 to a division and IPA's incorporation under the IGESPAR (Institute of Management of Architectural and Archaeological Heritage) plus the diminishing number of personnel, from 2007 onwards scientific production in CNANS decreased substantially. In 2012, IGESPAR was replaced by the DGPC (Directorate for Cultural Heritage), although it has within its purview the management and scientific appreciation of nautical and underwater archaeology, no specialized centre, division or section exists for that specific purpose.

Science and Academia

Besides CNANS focus in nautical and underwater archaeology, contributions towards maritime history and archaeology were coming from universities, scholars and the Naval Academy. Vasco Mantas (1990; 1996; 1998; 2003) has developed the field of maritime archaeology in regard to the maritime activity of cities and *villae* in Classical times and their contribution to roman Atlantic trade. This field of study received a major contribution by Maria Luisa Blot (2003), who linked nautical with urban archaeology research for Portuguese cities from Roman to Modern Age. Within the field of naval history, Francisco Contente Domingues contributed to our understanding of medieval and early-modern ship life, naval technology, navigation and nautical science. Some of his works on shipbuilding and navigation have become an essential part of nautical archaeology studies (Domingues, 1985; 2003; 2004). Note the work of Adolfo Silveira Martins (2001) and recent development of treatise research in a naval archaeology context (Fraga and Teixeira, 2012). Naval construction dynamic in the principal port of the country was studied by Costa (1997) and its characteristics by Caetano (2004). Furthermore, the Naval Academy has developed several aspects of navy and nautical technology and life aboard (Esparteiro, 1987; Monteiro 1993, 1997; Santos, 1991; Telo, 1991; Pedrosa, 1997, 2002, 2005; Salgado, 2001, 2004; Pereira, 2005, 2010). Worth mentioning is the approach in interaction of underwater archaeology with navy and ship history done by Augusto Salgado.

The first registered Portuguese academic involvement in the field of underwater archaeology, was the study of the sites Ria de Aveiro A and B, by *Universidade de Aveiro* in the 1990s.

Without the direct participation of CNANS, *Universidade Autónoma de Lisboa* (UAL) began the research project *As indústrias do mar no período clássico no barlavento algarvio* directed by Adolfo Silveira Martins. Started in 2005, the project goals were both nautical and maritime regarding ships and maritime structures along the roman sites of Abicada and Boca do Rio. In 2006 began project *PIAS - Estudo, Valorização e Monitorização dos Sítios Arqueológicos Angra A, Angra B, Angra E e Angra F e Navio Angra D (Terceira)*, a comprehensive approach of the underwater cultural heritage in the bay of Angra do Heroísmo, Azores (Bettencourt et al., 2006a). Developed by *Centro de História de Além-Mar* (CHAM), a research centre belonging to *Universidade Nova de Lisboa* and *Universidade dos Açores*. The project's goals were to study the port of Angra do Heroísmo from 15th to 19th centuries. For that effect this project counted the discovery of a series of wrecks in previous surveys done by the Portuguese government in collaboration with the Institute of Nautical Archaeology and Texas A&M University. Furthermore more wrecks were discovered and all represented an opportunity for the coherent research of ship's traffic in the bay ranging from Early-Modern to Contemporary times. This heritage was so substantial that the area where they lie has become Portugal's first Azorean underwater cultural heritage reserve. The complexity of the finds, the success of the project and the need to further investigate these wrecks led to the creation of an ongoing project discussed in the following section.

Portugal abroad

Being a maritime country, most Portuguese cultural heritage lies outside its borders. The availability of wrecks in foreign national waters and Portuguese participation in shaping the modern world has led many researchers to study its expansion period or history. Names such as Brad Loewen, Donald Keith, Eric Rieth, Jeremy Green, Filipe Castro, Richard Barker, Robert Grenier, Robin Piercy, Roger Smith, Sila Tripathi and Thomas Oertling are forever associated with the development of the field. These are only a few, many others, from all archaeology spectra, gave major contributions to every aspect of maritime archaeology. Moreover, every year, new foreign researchers join the ranks of our national researchers, from graduate programs across the world. A sign of the field's maturity is, in the words of George F. Bass (2011: 7), 'Long gone are the days when virtually all practitioners knew each one on a first name basis'.

The present

Notwithstanding the undeniable contribution of the disciplines of urban archaeology and rescue archaeology to the field of maritime archaeology in Portugal, we will focus on the development and current state of research regarding Portuguese institutions. Without any doubt, academia has become the spearhead of current research endeavours. The only credited institution by the Fundação para a Ciência e a Tecnologia (FCT, Portuguese science and technology foundation), currently developing studies in Maritime archaeology

is CHAM. The majority of projects explained in this section (Fig. 1) are under its research line in Early-Modern and Portuguese Expansion Archaeology, which pays special attention to structures and materials resulting from the process of Portuguese expansion in the 15th to 19th centuries, but also their reflections and interactions in Portugal and in Europe, looking at other colonial experiences in a comparative perspective. Besides incorporating land and underwater archaeology into a common research goal, the research is closely linked to other groups studying the same period in the economic, historic and social arenas. So a good part of the projects, while focusing on the study of archaeological

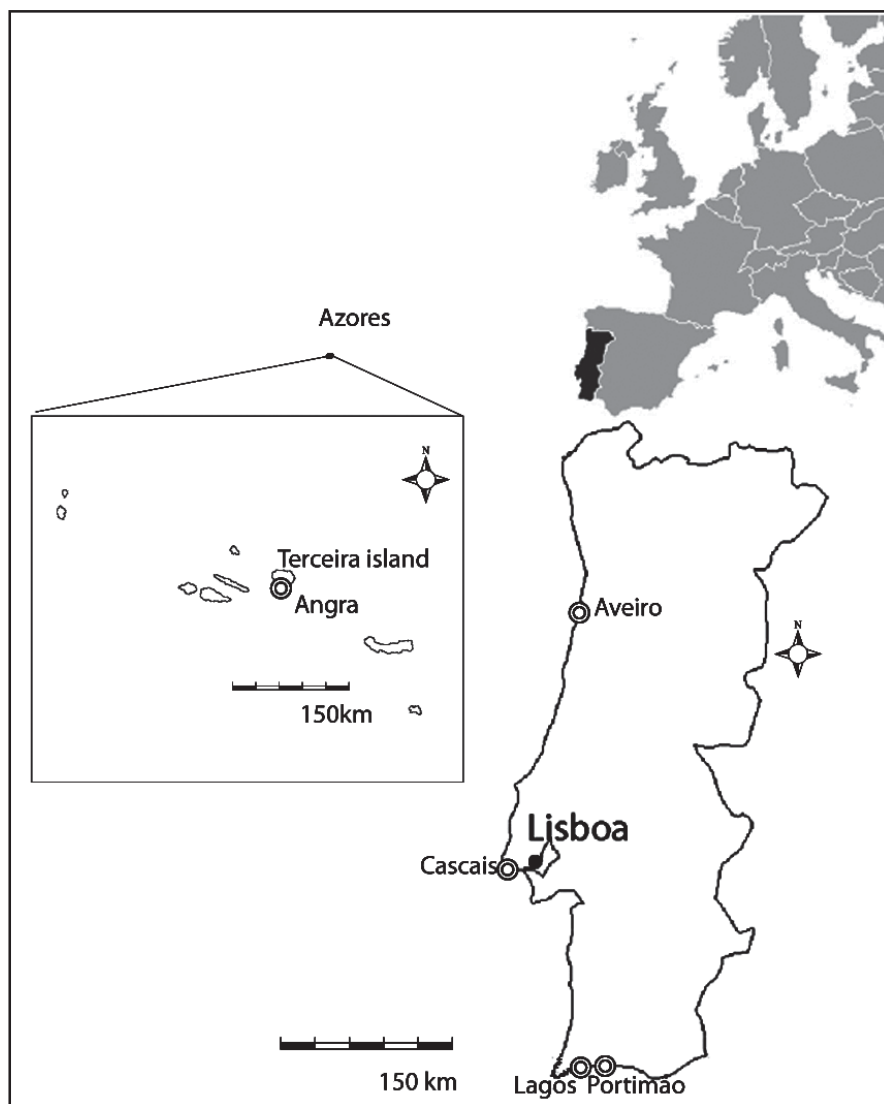


Fig. 1 Location of present projects. (Authors)

remains, have a permanent interdisciplinary character. UAL, since its first project in 2005, has developed some projects in collaboration with other institutions. However, presently only two are ongoing discussed below. Furthermore, until very recently existed *Instituto de Arqueologia e Paleociências* (IAP) from *Universidade Nova de Lisboa* and *Universidade do Algarve*, where some researchers were pursuing some related research.

ProCasc: geographic information systems applied to coastal archaeology and maritime landscape problematic

Started in 2005, the underwater Heritage Survey Project of the Cascais County (ProCasc), appeared as a form of coastal heritage management based upon maritime culture (material, immaterial and cognitive culture), which became since 2011 a joint effort of CHAM and Cascais municipality. The main objective has been the creation of an interactive process that allows for the inventorying of maritime cultural heritage. This process emerges as an information source but also a useful tool for research, conservation, protection and dissemination of maritime cultural heritage. This is in our view, fundamental to any coastal management or coastal archaeological research (Freire et al., 2012b). The study area between Roca cape and São Julião da Barra fortress is located at *Enseada Entre-os-Cabos* (Between capes cove), named because its boundaries are to the north Roca cape and to the south Espichel cape (Fig. 2). Into this area flows the Tagus, one of the major rivers of the Iberian Peninsula. Historically considered one of the best natural shelters of Western Europe it was a privileged shelter in the articulation of the ancient routes of the Mediterranean and Northern Europe trades. Furthermore excellent navigability in the river allowed for the navigation and penetration into an immense inland territory. The research methodology is based upon two analysis axes derived from Northern Europe, U.S. and Australian approaches. The first aims to establish and identify the cultural elements characterizing coastline dynamics, both terrestrial and submerged, based upon *Maritime Cultural Landscapes* concepts (Westerdahl, 2011). The second seeks to interpret *coastal archaeology*, particularly questioning the impact and influence that the environment and marine processes have on human occupation, especially in its continuums and dynamics, social aspects and cognitive perceptions and natural coastlines (Ford, 2011). As elements for analysis of Cascais' coastline are considered cultural heritage related directly or indirectly to the maritime industry, including underwater archaeological sites, loss traps, terrestrial sites (forts, lighthouses and stone crosses), data directly linked to nautical activity (toponymy, cartography, geomorphology and hydrodynamics) and intangible cultural heritage (maritime ethnography and religious traditions). The initial result of this analysis allows for the framing of these elements into several categories (cultural, political, economic, military, environmental and technological). Its study has correlated spatial distribution of elements, demonstrating relationships, dynamics and historical behaviours in coastal Cascais.

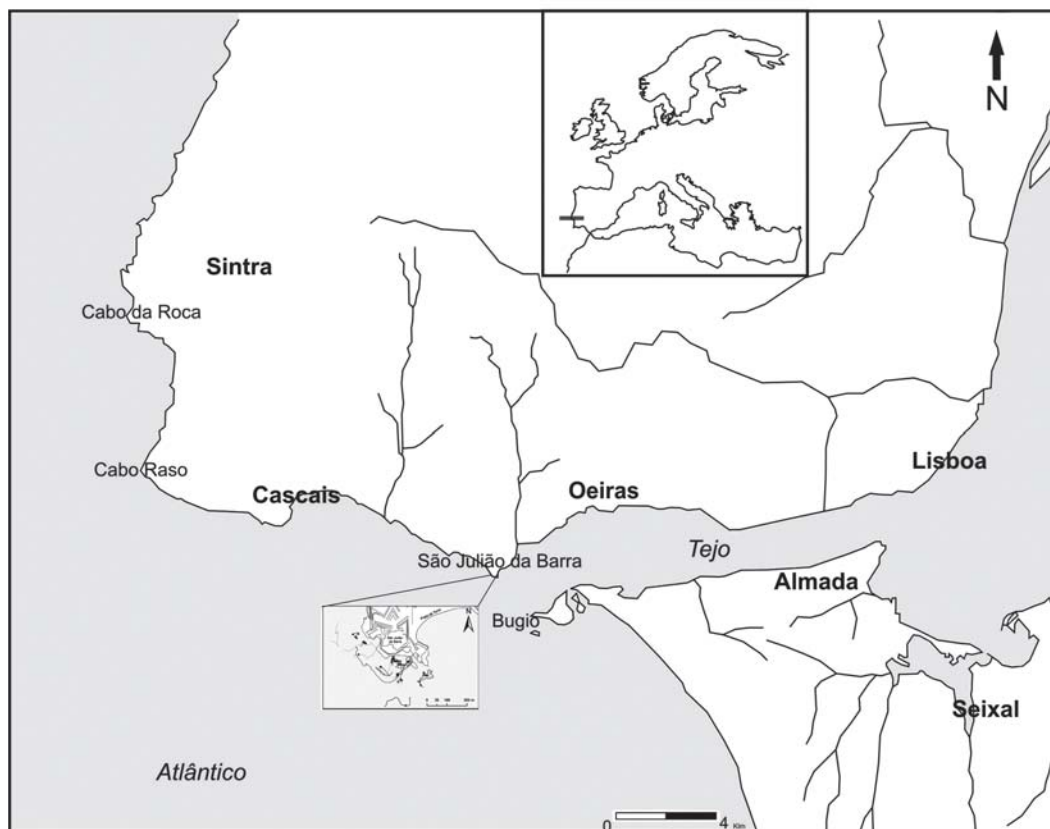


Fig. 2 A summary of the work that is being developed on the coast of Cascais. Relations between Underwater archaeological sites, heritage land and historical sources are placed in evidence. (Jorge Freire)

Indeed, work undertaken so far suggests a combination of elements and categories which form a unity, an organization of maritime space as a *zone* of Cascais *transport and communication (transport zone)*, defined by natural barriers and other landmarks (defensive or religious, for example) which assisted navigation (*transit points*). The diachronic of this historic maritime space is provided by the continuity of certain structures, the number and location of historic shipwrecks, the diversity of traditions and archaeological sites, particularly in terms of customs and mental perceptions of the sea and the shoreline. Framed by the theoretical analysis of the *cultural landscape and maritime archaeology coast* between the coast of Cascais and Lisbon, Geographic Information Systems (GIS) currently in development at CHAM aims to integrate human data on space usage starting from the Iron Age. The layers related to coastal anthropomorphism systematize archaeological and historical data. Among the first GIS layers are the archaeological work carried out so far in the study area, the sites and existing cultural heritage. Therefore this phase includes

georeferencing fieldwork of all existing assets, including wrecks, harbours and other isolated objects. Furthermore, GIS is also an essential tool for planning and controlling the diving, registering survey transects or photographic records, for example. Presently, ProCasc is focused on fortuitous findings declared to Portuguese authorities. This comprises the visual surveying of two specific areas - Guia and the immediate vicinity of São Julião da Barra fortress. These works are an essential part of the project and include relocation and GPS mapping, analysis of conservation parameters, chronology and exhibition contexts and materials. To date 10 shipwrecks were georeferenced plus 61 occurrences of cultural heritage (Fig. 3) with a chronology ranging from classical times to the present day (Freire and Fialho, 2011).

Historical data systematize the written and oral information about various events (shipwrecks, for example), with the potential to result in cultural heritage finds in the territory. These data having no accurate spatial information require spatial analysis and distribution of events by zones. The coast of Cascais was thus divided into nine zones (Guincho, Raso cape, Oitavos, Guia, Santa Marta, Bay of Cascais, Estoril, Carcavelos and Parede), according to local council borders. Towards the sea, these areas were arbitrarily confined to the 50 m depth isobath. Up to present times nearly 200 shipwrecks are



Fig. 3 Identification and recording of one of the iron guns at Area B in São Julião da Barra. (Augusto Salgado)

recorded in the written sources, concentrated mainly in Carcavelos, Raso cape and the Bay of Cascais (Freire and Fialho, 2009). The GIS also includes historical cartography and antique photographic information, plus georeferenced and vectorised cartography to extract the most relevant information - routes, shoreline, toponymy or maritime expertise. Both sources allow studying the evolution and significance of current coastal sites, including those related to fishing grounds, which hold the traditional view of the spots utilized by mariners. The analysis of human use of space is done considering its natural framework, including GIS information on geology, bathymetry, sea floor and sediment, currents or wave action, and specific data related to archaeological remote sensing prospection. Two interventions by their scientific but also social relevance are significant as they represent key moments in the history of Portuguese archaeology and regional landmarks that shape local spatial identity.

The first is the monitoring work conducted in 2009 in the training-ship *Pedro Nunes*, of former clipper *Thermopylae*, torpedoed off the Cascais' bay in October 1907. The multidisciplinary nature of this intervention potentiates a comparative analysis with the pioneering oceanographic work of the Portuguese King D. Carlos (1863-1908), conducted in 1896 on Cascais coastline. Pertinent was the georeferencing of five of the various geological and biological sampling stations utilized by the monarch. This allowed a data set with 100 years, reaching a new interpretation of the sinking of the *ex-clipper*. A new working hypothesis, proposed by Jean-Yves Blot, makes us believe that behind the ship's intentional sinking was the creation of a barrier against the practice of intensive trawling or to establish an artificial reef for marine life support (Freire et al., 2009). The other highlighted intervention is the underwater archaeological complex of São Julião da Barra fortress (Freire et al., 2012a). Intervention is being directed within an integrated analysis of historical and archaeological context. Work has resulted in the georeferencing of the interventions carried out between the years 1992 and 2000 by Filipe de Castro and Francisco Alves (Castro, 2002b). Relocating and georeferencing the most relevant areas in previous years, has permitted an assessment of the current state of scientific knowledge regarding this specific heritage. The usage of GIS tools and current survey methodology has revealed the existence of discrepancies in the earlier research cartographic information. Moreover, new discoveries located around the fortress resulting from this project reinforced the importance of this complex. Comparison of field work results with documentation and bibliography indicate that, except where the Pepper wreck, the probable *Nossa Senhora dos Mártires* wrecked, the remaining existing contexts are poorly understood. This is due partially to the absence of systematic studies on other located materials, but also to the lack of data on the manner in which the artefacts were collected. This project has allowed for a greater knowledge of the maritime landscape of Cascais and for better approximation of science to the general community. This was by integrating educational endeavours, both at graduate level and by creating community awareness.

River studies: surveying underwater cultural heritage in Arade's estuary

Throughout its history, the river Arade played a polarizing role in the development of economic exchange in southern Portugal, asserting itself as one of the central places in the daily life of coastal communities. The people who settled in this area have always explored different river usages, as a source of energy, a natural resource, commercial, industrial or cultural hub and as a means of transportation and communication. Human occupation of the Arade basin is recognized from the sixth millennium BC, occurring along the coast near small watercourses. In the Bronze Age settlements concentrated near copper mines in the nearby mountain ranges. The first-millennium BC establishment is polarized around two riverside locations: Cerro da Rocha Branca (near Silves) and Ferragudo (Morán, 2003: 328). Moreover, some authors believe that Arade's estuary is the location of *Portus Hanibalis*, built by the Carthaginian general Hamilcar Barca (Carrapião et al., 1974: 40). In the Roman period a phase of intense settlement was initiated encouraged by the existence of abundant agricultural and marine resources essential for the fishing industry. Identification of multiple archaeological remains testifies an intense commercial activity, whose origins may go back to Phoenician-Punic age (Blot, 2003: 278-280). In the medieval-Islamic period, there is an increase in crop production due to technological improvements around Xelb, present day Silves, the main harbour city located inland along the Arade River. This rich hinterland led to several military incursions by opposing parties, as the naval battle that took place in 966, between a fleet of 28 Viking ships and a Muslim fleet (Coelho, 1989: 129-130). Centuries after, Portimão, a city founded in the estuary around the 15th century, becomes the main port in Arade, due to the progressive silting of the riverbed (Blot, 2003: 282). The existence of an intense coastal pirate activity led to fortification building (Carrapião et al., 1974).

Historical cartography analysis resulted in an understanding of significant changes in bar configuration and navigation conditions in the Arade River during modern era (Bettencourt et al., 2007). These changes suggest that navigation in the estuary was conditioned by unstable sediment, until the 20th century. These intense anthropogenic dynamics have led to a complex set of submerged cultural heritage. The recognition of underwater archaeological potential of Arade River dates back at least to the 1970s. Since then consecutive dredging has caused the destruction of several recurring archaeological contexts as evidenced by the recovery of some artefacts. Archaeological interventions conducted between 1998 and 2007, promoted by CNANS, Portimão Council Museum (MMP), GEO, INA and the Museum of Anthropology and Ethnology from University of São Paulo, contributed decisively to the recognition of its scientific value and equity, as mentioned above (Castro, 2005).

The scope of the present project is studying the following sites: Ponta do Altar A and B, GEO5 and Arade B GEO7. Ponta do Altar A site was detected in 1975 by a group of

divers and consists of five iron cannons and iron shot, dated between the 17th and 18th centuries (Gomes et al., 1995: 85; Castro, 2005: 56). Ponta do Altar B site was a fortuitous find of five bronze guns, by two local divers. In 1993, a MNA mission located three more bronze guns, plus two anchors, one iron cannon and other small finds, pointing to an early 17th century shipwreck (Alves, 1997b). A second fortuitous find of another bronze gun led to a mission in 2006 by CNANS, which located another bronze gun. The current hypothesis is of this being the final resting place of a ship in the service of the Crown of Spain (Bettencourt et al., 2007). Ponta do Altar A and B are two archaeological contexts of great scientific potential, where future archaeological work could substantially contribute to the knowledge of navigation in southern Portugal between the 17th through 18th centuries. The site GEO5 was initially identified within the GEO's project in the area (Machado, 2001). In 2004, due to expected dredging works and construction of port infrastructures, the MMP carried out a survey to identify and study any underwater cultural heritage that might have been threatened. This led to characterisation a large vessel, whose traces extend over an area of about 28×10 m, presenting an orientation NE / SW. GEO5 is one of the best preserved nautical contexts of Arade River (Fig. 4). This is a wooden vessel with bronze fittings, of a tentative chronology of 18th to early 19th centuries (Fonseca, 2005: 13-15).

The area of sites Arade B and GEO 7 is characterized by a complex reality of difficult archaeological interpretation, because it is likely to be a secondary context, which suffered post-depositional disturbances as a result of dredging in the area. Noteworthy is the existence of roman period amphorae mixed with scattered remains of modern age nautical structures (Machado, 2001; Rambelli et al., 2003; Bettencourt et al., 2006b). Most materials from Roman times may be related to port operations. However, the identification of two complete amphorae and several fragments fitting into the typology Dressel 7-11 (source Bética produced between the late first century BC and the early second century AD) suggests the hypothesis for a shipwreck from Roman times (Bettencourt et al., 2006b: 271). The recent discovery of more remains in this area that fall in this typological and chronological context, give credence to this hypothesis. Thus archaeological remains of modern chronology at Arade B and GEO 7 are testimony to maritime activity continuity until the 18th century. The anchors located in the area are of common typologies of the 16th to the 18th century. Wooden remains included blocks and ship's timbers of at least two different construction typologies (Fig. 5), skeleton first and bottom first. Noteworthy is the discovery of a lapstrake frame, one of the few archaeological remains of this type to be identified in Portugal (Bettencourt et al., 2006b: 271). This discovery could be related to Arade 2, a lapstrake construction ship destroyed by dredging in 1970. Dredged sediment was deposited in the area where Arade B / GEO 7 rest today. Thus, the work done up to the present suggests that the area known as GEO 7 may correspond to a continuation of the Arade site B. Missing, however, contextual relationship between these two sectors of

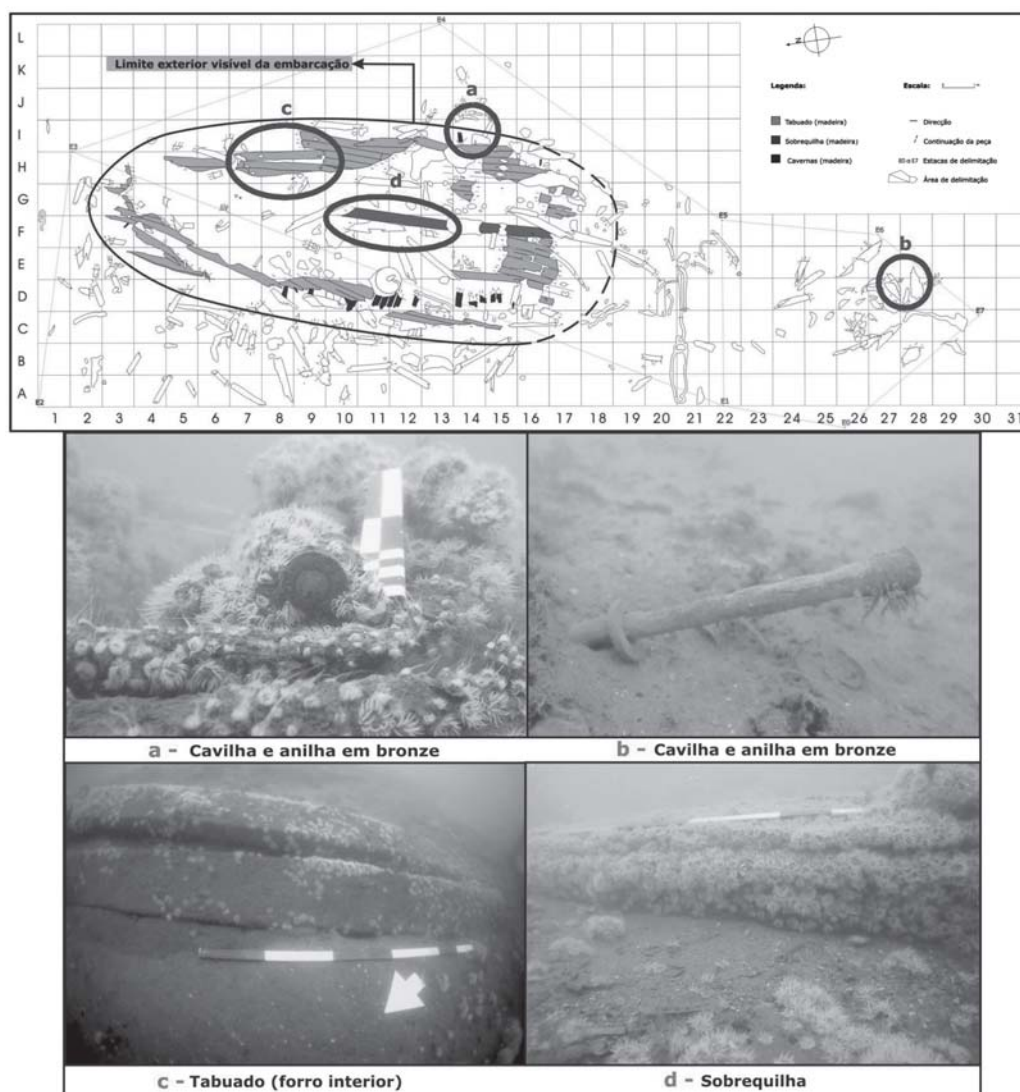


Fig. 4 Drawing, interpretation and detail of Geo 5. (Fonseca, 2006: 135)

the Arade river, verify the existence of potential primary deposits and obtain new data to complement the current knowledge of the site and enhance the scientific research of issues related to roman and modern navigation. The advantage of river studies is in the possibility of direct connection of underwater cultural heritage with the settlement utilization of the riverbank (harbours, ports, fishing, exploration of marine bio-resources, watermill). As such the study of these sites, in conjunction with urban archaeology results and in a holistic approach to occupation patterns, is a strong contribution to the understanding of southern Portugal secular maritime history.

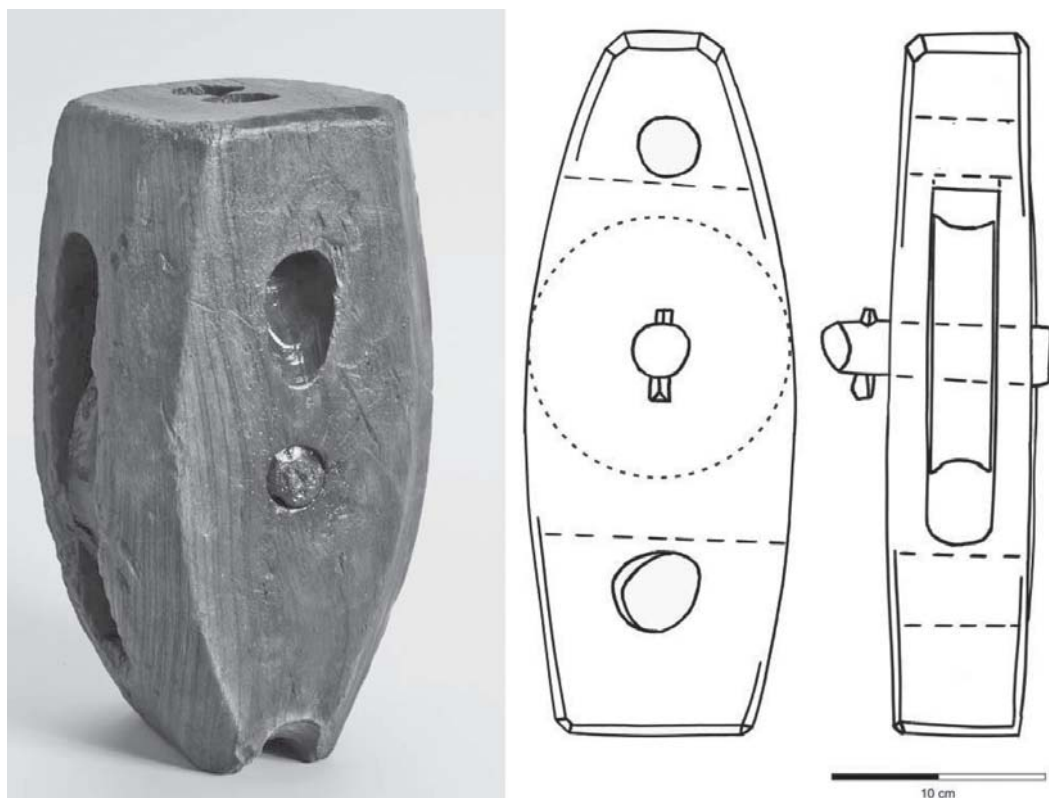


Fig. 5 Two blocks possible from 16th century recovered at Arade B. (José Paulo Ruas and José Bettencourt)

Ships, navigation and commerce in the Aveiro region in Late-Medieval and Early-Modern Age

Aveiro estuarine system-shallow lagoon has approximately 50 sq. km and is located on the northwest coast of Portugal. Of recent formation, it had its genesis in the 10th century, because of a sandy shoal development from north to south, reaching its actual morphological expression in the mid-17th century. The lagoon formation ended in mid-18th century (Corrochano et al., 2000; Bettencourt, 2009). Historical cartography analysis depicts significant changes in bar configuration of Ria de Aveiro's navigation conditions during medieval, early-modern and modern periods. These suggest that navigation in the Ria de Aveiro was conditioned by profound morphological changes related to sedimentary processes, which converted the lagoon in an intricate system of canals constantly changing. This rapid evolution also influenced sailing conditions and port access inside the lagoon. By the end of the 16th century it became necessary to construct an artificial link between the sea and the lagoon. After several attempts of opening and maintaining an artificial bar, which was progressing to south, the present one was opened in the early 19th century

(Bettencourt and Carvalho, 2008). Despite the insufficient archaeological research developed in this region, we can state that the occupation of the area bounded by the Ria de Aveiro has been determined over the past millennia by resource exploitation and maritime activities. The oldest riverine evidences of occupation, now distant from the shoreline, date from the Iron Age. More recent are the remains discovered in Cacia, the *Marinha Baixa*, which correspond to a late-Roman occupation, from the 4th to 6th centuries, related to port functions, possibly due to a probable coastal or estuarine position (Sarrazola et al., 2001: 27; Blot, 2003: 194-204).

In the middle Ages, with the lagoon's formation, several ports (Esgueira, Cacia, Murtosa, Ovar, Aveiro, Vagos and Hlhavo), earlier in coastal environment, became integrated into the lagoon complex. This allowed for the development of maritime activities, such as fishing or salt industries (Amorim, 2008). By the early 16th century, fishermen from Aveiro were also involved in cod fishing, an activity with an intense economical, social and cultural expansion in the north of Portugal. Around 60 ships went out annually to Newfoundland. This number increased steadily reaching 150 in 1550. The relevance of commercial fishing activities also led to the development of a shipbuilding industry, mainly constructing vessels with 40 to 70 tons capacity (Costa, 1997). These appear, for example, on documentation related with Brazil trade (Costa, 2002: 180-184). In this framework, trade brought food supplies, manufactured goods and raw materials, including iron, necessary for main activities (Silva, 1991; Huxley, 2003; Alonso, 2003). Furthermore, this allowed the export of salt and surplus fish to Northern Europe by the 13th century. Historical registers describe regular trade contacts occurring with Ireland, Flanders, the Atlantic Islands, Galicia, England and the ports of the Bay of Biscay (Huxley, 2003; Allan and Barber, 1992; Costa, 1997; Amorim, 1997). Besides these activities, written documentation also attests to intense pottery industry, particularly in the villages of Ovar, Aradas, Ouca and Bairro das Olarias located in Aveiro's county, producing red and black earthenware intended for daily use and construction (Silva, 1987: 53-77; Silva, 1991). These productions assumed an important role in the following centuries. This intense maritime activity has led to a rich cultural heritage, as attested by regular fortuitous finds in the region. These originated several archaeological works in the region, some of which are already mentioned. The present project conducted by CHAM aims for the study of an integrated set of archaeological sites from Medieval and Early-Modern period in the Aveiro lagoon, such as Ria de Aveiro A, Ria de Aveiro B-C / D and Ria de Aveiro F-G.

The Ria de Aveiro A site corresponds to the remains of a wooden vessel carrying earthenware cargo (Fig. 6). The site had two intervention phases under the scope of two research projects. The first phase, between 1996 and 1999, was developed by CNANS in cooperation with Universidade de Aveiro, involving experts in geology, geophysics (Pinheiro et al., 1998: C47 - C50) and ceramics (Castro et al., 1998). This stage gave particular relevance to the vessel remains, which were excavated, recorded and recovered (Alves et



Fig. 6 Detail from Ria de Aveiro A excavation. (José Bettencourt)

al., 2001a; Alves, 2001c). The second phase, between 2000 and 2005, was developed in the framework of CNANS research project, financed by FCT, which was focused on the excavation and study of the ship's cargo that remained *in situ*, in order to understand its distribution. The project also aimed to study the space organization onboard and to characterize the assemblage typologically and technically. Excavations carried out in both phases concluded that the ship structure had most of the features related to the Iberian shipbuilding from the 15th-16th centuries (Oertling, 2005). Artefacts glazed or deformed surfaces and charcoals distributed among archaeological materials are evidence of a fire, during or after the wrecking. The continuity of this project intends to integrate the remains in its historical and cultural significance through the study of site formation processes in the lagoon environment, Atlantic shipbuilding, and earthenware production in the Aveiro-Ovar region and its commercial circulation. The archaeological site Ria de Aveiro B-C is located in the main channel close to *Canal das Pirâmides*, near the historic centre of Aveiro. As a result of archaeological work developed there, it was concluded that this area presents in almost all of its length, a wide range of ceramic materials, possibly related to port activities or shipwrecks that occurred between the 15th century and the present day (Alves et al., 1998; Bettencourt, 2009). This distribution might be related to the intertidal currents, as well as with the dredging works carried out in the vicinity of this area, during the 1970s.

The ceramics are one of the largest collections of Portuguese pottery from underwater contexts (Fig. 7). It includes productions of regional manufacture, faience, stoneware and imported materials (such as Columbia plain, pipes, olive jars and *bellarmines*). The earthenware is the most represented and comprises one of the most homogeneous collections under a manufacturing context, probably produced in the Aveiro/Ovar factories. The remains of Ria de Aveiro B-C are a reflex of the intense activity of Aveiro harbour and the lagoon's role in the European and Atlantic trade (Coelho, 2009; Coelho and Coelho, 2012). In Ria de Aveiro C contiguous area a shipwreck it was also discovered loaded with tiles and bricks of unknown chronology, designated Ria de Aveiro D. This archaeological site displays part of the cargo *in situ*, as was stowed inside the vessel. The tiles are fitted on each other, over the bricks, and it was possible to identify the vessel's wooden structures (Bettencourt, 2009).

This study intends to conduct a comprehensive review of these archaeological sites through detailed analysis of the available archaeological data plus studies on the ceramics for provenance determination. Ria de Aveiro F-G sites include the remains of two medieval

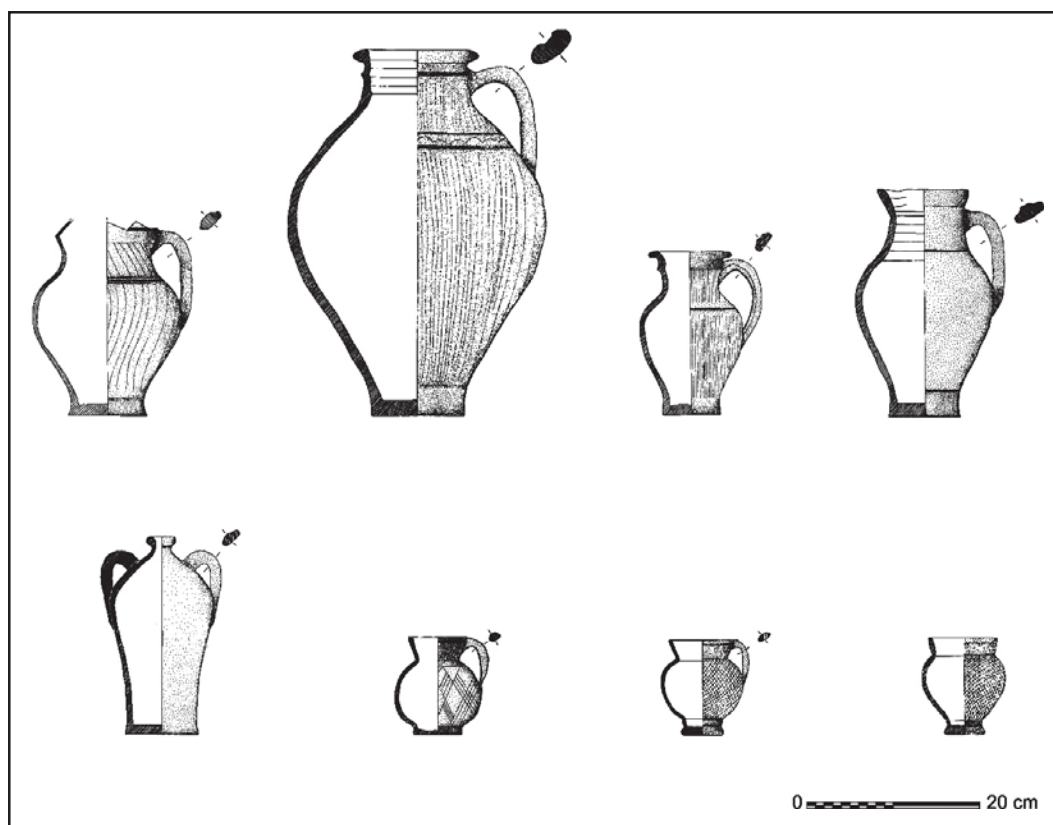


Fig. 7 Earthenware from Ria de Aveiro B-C. (Inês Pinto Coelho)

ships discovered during archaeological monitoring of the Aveiro's harbour expansion (Alves and Ventura, 2005; Bettencourt, 2009). A preliminary analysis of *Ria de Aveiro F* ship structures does not allow, at this moment, comparison it with any shipbuilding tradition in particular. On the other hand, the characteristics observed in *Ria de Aveiro G* ship place it in the lapstrake shipbuilding tradition, where the ships were built on the principle of shell first. The study of these evidences will increase the knowledge of maritime relations between Portugal and Europe during the middle Ages. Moreover it also allows the understanding of vessel types that operated in those circuits. This project intends to promote research on ships, navigation and commerce in the Aveiro region, based upon archaeological sources, to develop an integrated research program of archaeological and historical sources related to maritime activities in the lagoon, and most of all, to identify, characterize and disseminate this heritage's scientific, educational and cultural potential. Some of these sites record an intense regional ceramic production, whose range must be studied to understand the economic role of this region in Early-Modern Age.

An Iberian ship for the Atlantic: shipbuilding, life aboard and Angra port of call in the 16th and 17th centuries

Existing knowledge on the Iberian expansion of the 16th and 17th centuries indicates a key role of Angra city as a port of call for fleets that circulated in the Atlantic (Matos, 2005). The city had to adapt to these new functions, providing itself with the institutional, economic and operational structures needed to support and protect the ships in transit. Literary and archival sources document usage of Angra's harbour in this period by small boats specialized in coasting and inter-island navigation and larger vessels linking the islands to Europe, America, Africa and Asia. Methods of design and shipbuilding, shipyard's organization and nautical equipment have been understood mainly through written sources, the same occurring with Angra's port logistics and life aboard (Domingues, 2004; Rahn-Philips, 1992; Serrano Mangas, 1985). In this context of intense nautical activity, it was natural that ship losses were frequent in Angra bay and they were often mentioned in State correspondence. Those wrecks constitute an essential tool to fill gaps in our knowledge about vessels operating in the Atlantic. Although references to artefact recovery from Angra bay in the 19th century do exists, the first systematic surveys for underwater cultural heritage happened in the 1950s. Between 1961 and 1965 the Portuguese navy and the air force recovered five bronze guns associated with existing fortifications in the area. The following decade's survey and recovery operations conducted by English teams focused on specific targets resulting in some finds (Bettencourt and Carvalho, 2009: 76-77). In 1996 the first archaeological research in the area was started, originating from the collaborative endeavour of the local museum together with INA. Several survey and excavation field missions allowed the location and registering of shipwrecks from 16th to 19th centuries (Crisman and Garcia, 2001). In 1998 CNANS excavated Angra C

and Angra D remains, in a rescue mission due to the eminent construction of a new marina in Angra (Garcia et al., 1999). In 2001 the fortuitous finds of Angra E and Angra F and three years later project CASA discovered another wreck (Angra G) in the harbour (Garcia, 2005). As mentioned, the majority of these sites were subject to intervention by project PIAS, from CHAM (Bettencourt et al., 2009). This project under CHAM and supported by FCT, approaches those themes through history, archaeology, ecology and biology perspectives from the integrated study of the Angra wreck sites, in conjunction with written and iconographic sources related to Atlantic navigation and specifically this port of call.

The project's first goal is to understand the maritime historical landscape of Angra. Port operation studies are being conducted through systematization of existing written sources, with regard to questions as origin, type and ship's function, harbour institutional organization and economic management, port related works and infrastructures, among others. This is accomplished by GIS utilisation, organizing the available evidence, archaeological surveys, iconography, cartography and aerial photography, for our understanding of anchorages, moorings, platforms, shipyards, beaching places, warehouses, coastal fortifications, custom, hospital and shipwreck location. Written data will be compared with archaeological records. Furthermore, a systematic survey of the bay and the revisiting of previously located sites are being currently continued. The second goal of this project is to reconstruct Angra D vessel and its economical, cultural and social contexts. A preliminary assessment of its context suggests it was built in the Iberian Peninsula in late 16th or early 17th century AD. This shipwreck because it preserved a considerable part of the ship's wooden structure, plus several artefacts related to life aboard and navigation represents an opportunity to understand Iberian shipbuilding tradition related to vessels used in transoceanic navigation. Given the teams' interdisciplinary expertise several issues related to shipbuilding: (raw materials, wood resources management, shipbuilding techniques, naval architecture and shipyard labour), life aboard (nourishment, social organization and hierarchies) and ship organization (stowage, on board space arrangement) are being approached. Gaps in knowledge about the construction and operation of large vessels built in the 16th and 17th centuries are the result of lack of sources of information on technical aspects. In this context, the study of Angra D is considering several aspects related to structural elements, fastening and assemblage techniques (Fig. 8). An exhaustive analysis of the timber remains regarding the identification of the wood species plus the recognition of usage criteria is particularly helpful for naval construction study, timber trade, the ship's ports of call and its shipyard. Timber dimensions have been analysed in relation to metrology used in Portuguese and Spanish shipyards. Ship design derived from the archaeological record has been confronted with historical and iconographical documents to define the underlined building concepts. Hypotheses regarding the ship's life, including vessel repairs, function, use and capabilities have been formed.



Fig. 8 Work on the 1:1 tracings of the wooden hull of Angra D. (Andre Teixeira)

Currently underway is the analysis of various archaeological topics about material culture available related to vessel operation and cargo: armament and munitions, ceramics and glass origins, available sanitary and medical conditions, space arrangement, existing food species and cooking conditions, crews and passengers age and gender evidences, religion and hobbies. Ceramic studies undertaken so far, evidence the similarities between this set and other Iberian shipwrecks recovered in the 16th to 17th centuries (Fig. 9). Finds included olive jars, Columbia plain, blue on white and blue on blue of probable Iberian origin. A part of polychrome ceramic of German production from the region of Werra, as small fragments is clearly identified as German stoneware and Chinese porcelain. As to unglazed earthenware, is undoubtedly from productions named *Merida ware* or *red micaceous ware*, often attributed to Spanish origin, but also produced in the Portuguese region of Aveiro in the 16th and 17th centuries, as mentioned (Bettencourt and Carvalho, 2008; Coelho, 2009; Coelho and Coelho, 2012). As for other manufactures, it is suggested that they might belong to insular productions, eventually constituting contamination of archaeological deposit. Artefact study is still ongoing to determine more origins, understand trade and daily life.

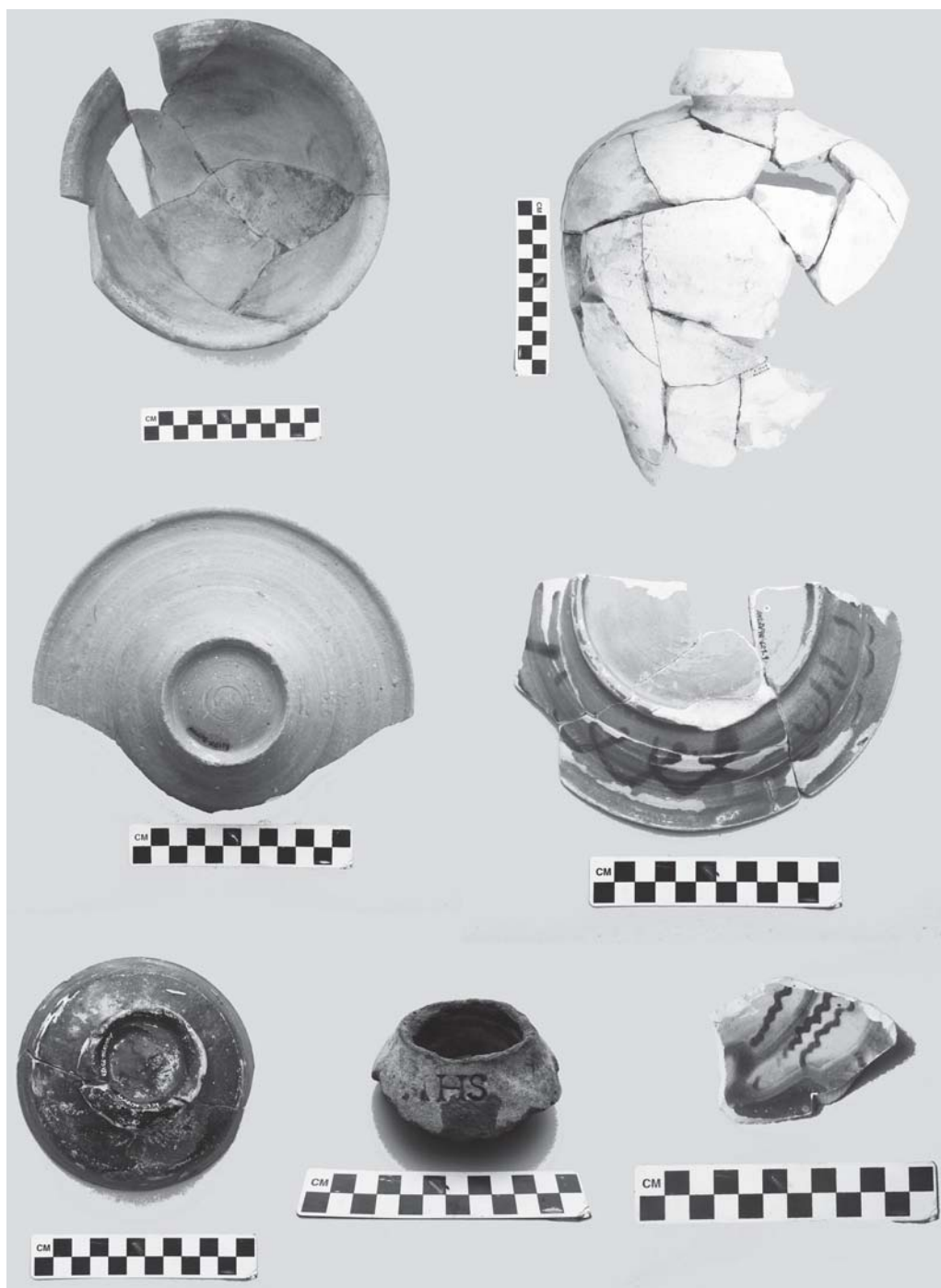


Fig. 9 Domestic non glazed earthenware, olive jar, blue on blue, columbia plain, olive jar rim and german majolica from Angra D wreck. (André Teixeira)

Gunboat Faro: the study of imported technology and the cultural adaptation to technical innovations

Lagos, a port known since classical times as one of the more apt anchorages for harboring vessels from the Mediterranean before venturing into the Atlantic, becomes in the early Modern age one of the main harbours of Portuguese overseas expansion (Coelho, 1991; Barbosa, 1993: 24; Blot, 2003; Loureiro, 2008). The previously mentioned PCASCL project intended to understand the development of Lagos city in southern Portugal, regarding its maritime interface (Fraga et al., 2008). Among other cultural heritage, the wrecked remains of an iron composite vessel near the stream of Alvor, dubbed Lagos D (Fraga and Martins, 2011) was identified. This project started by UAL with the collaboration of the National Navy Museum, intended to positively identify Lagos D remains as the Gunboat *Faro*. Lagos D lies about 850 m from the shoreline at a depth of 16m and occupies an area of 792 sq. m. The ship, until its positive identification, was baptised as ‘Steam Star’ by a team member. The ship broke into two sections. The first section comprises half a ship from the stern to the boiler area (Fig. 10 and 11). The second section is the bow’s remains which became scattered over a 271 sq m area (Fig. 12). The best preserved is the stern area until amidships where the site is coherent, where parts of the engine, the boiler and the framing of the vessel are visible. Amidships forward, no coherent structures are



Fig. 10 Stern section of probable gunboat Faro. (Augusto Salgado)

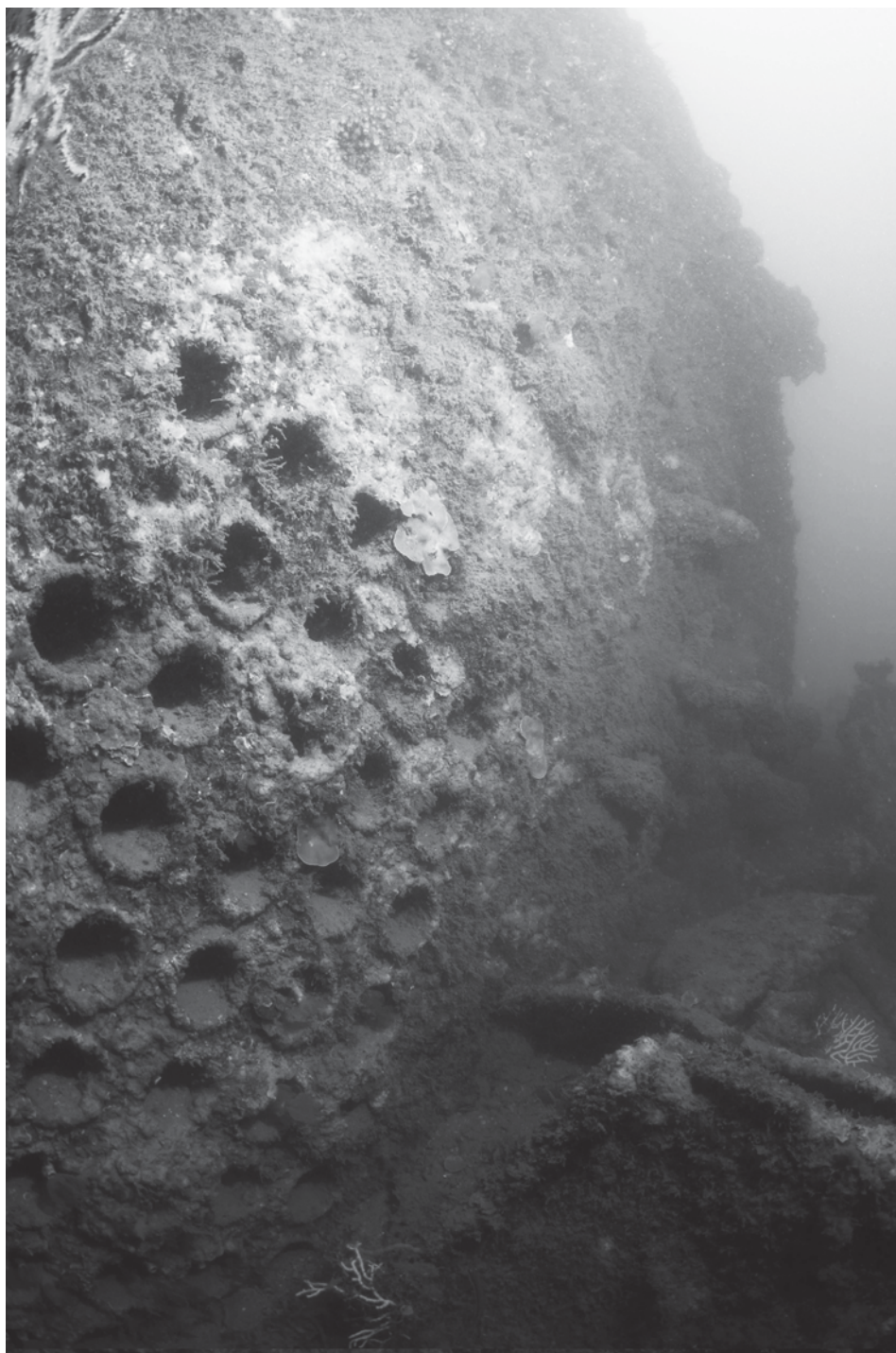


Fig. 11 Detail of boiler of probable gunboat Faro. (Augusto Salgado)



Fig. 12 Piece from stern area of probable gunboat *Faro*. (Augusto Salgado)

visible, only some odd pieces of the bow remain here and there where a beak-head is recognizable. The ship appears to have sunk bow first. The non-intrusive surveys done inside and around failed to identify any personal possessions or any type of cargo. However several small artefacts were recovered for identification, including ammunition. At the present time, our evidenced points to this as the final resting place of the gunboat *Faro*. The gunboat *Faro* belongs to a group of military and technological innovations that occurred in the last quarter of the nineteenth century. From an international perspective, this ship belongs to the innovative line of shipbuilding begun with the British HMS *Warrior* and HMS *Recruit* by Thames Iron Works. Nevertheless, for lack of an absolute identification of the shipwreck as the gunboat *Faro*, this is the only known specimen of an iron-hulled gunboat acquired in British shipyards. In a national perspective, the detailed study of this ship improved our knowledge on shipping industry and Portuguese military history. One of the main questions of the project was to determine Portuguese cultural forms and signatures that overlay the original English design. Furthermore, explicit areas of the wreck were studied in order to understand shipbuilding techniques and Portuguese adaptations. Although of English design, several changes regarding military accommodation and even shipbuilding alterations were discovered. Those include the changing of armament and fixing structures throughout several modifications, refurbishment of ceiling and space to reflect the social status of crew members and experimentation with the engine's design. This demonstrates the navy's capacity to adapt imported technology to Portuguese reality.

Other projects in Portugal

The above presented projects are mature, with publication record and as such were explained in detail. However, several others are registered by Portuguese authorities, recently begun and without substantial results at this time. One of them is the study of the archaeological potential of the French ships *Ocean* and *Redoutable*, lost in the 18th century in the context of Lagos battle (1759), in order to create a geo-referenced detailed map of the dispersion area. This is based upon a field trial out at *Ocean* wreck site done by Subnauta diving company, where pinpoint mapping of metal artefacts through magnetic surveying was attempted. By the usage of Geometrics transversal gradiometer identification of the remains was possible together with discoveries of buried artefacts, which were also classified utilizing only the remote sensing data. As such this type of interventions brings to new level non-intrusive surveys. In the field of nautical archaeology, under CHAM is the location of a *Patacho Pedro Diaz*, a little-known type of vessel, but ubiquitous in the Modern Age, lost during a storm in Martinhal bay, southwest Portugal, in 1608. Information gathered from local fishermen plus a preliminary survey, carried out by the INA in 2007, uncovered evidence of a 17th century shipwreck in the bay. Since no research regarding this site has been developed, it is the aim of this project to relocate and study it. This will be the first discovery of this type of ship on the world's stage. Surveying for this wreck will utilize a combination of remote sensing hardware and ethnographical information from existing local communities. Linking these two allows for an increased success in wreck location because it utilises state-of-the-art equipment available to present archaeology without disregarding the millennium ethnographic knowledge of the local communities. Moreover, this project is focused on a ship type outside of the scope of ships of discovery or overseas expansion and trade. The research question driving this type of project is the understanding of small tonnage shipping, and like their bigger counterparts, Iberian-Atlantic construction features.

Another project is *Underwater Heritage Charting of Grândola County*. This project originated with a memorandum of agreement between IAP and the local council. It intends to research underwater cultural heritage and characterize the historical evolution of the county's landscape, through surveying, probing, immaterial data and remote sensing. One historical record stands out: *Nuestra Senora del Rosario*, lost in Tróia while travelling from the Dominican Republic. Despite later efforts, little was recovered from its cargo. Using new documentary sources the project attempted a theoretical construction for the present ship remains area (Monteiro and Pinheiro, 2012: 159). Located in 2011 by sport divers and surveyed in the same year, Troia 1 is the remains of a 19th century sailing ship where presently an interdisciplinary project by UAL is being developed. Besides part of the ship's structure, other artefacts related to rigging and outfitting remains. Proposed endeavours in registry and excavation of this site intend to respond to ship's identity and story plus a social economic context. Work will include remote sensing survey plus

archaeological recording of structures and artefacts and wood species identification. Besides the questions related to the vessel itself, this project is expected to give a short contribution to a more comprehensive regional and social-economical history. Finally, the scattered site in Horta bay, located in Azores archipelago, while this originated within the field of rescue archaeology, due to its relevance and dimension it became a research project in CHAM's mentioned research group. The planned Horta's harbour expansion required impact assessment of underwater cultural heritage. Initially visual and magnetic survey was conducted in the area (Bettencourt and Carvalho, 2011). Afterwards surveying, excavation and retrieval of existing archaeological contexts was done. These include materials associated with a wreck, named BH-001, namely iron guns, fire arms, ceramics, glass, metallic or wooden artefacts and a cargo of elephant tusks. The wreck is preliminarily identified as an 18th century English merchantman. The development of this project intends to be a contribution towards the understanding of Atlantic trade in this period.

Making the bridge

Although this text might seem Portuguese biased, we are well aware that reporting the rich and diverse maritime archaeology research on Portuguese History is not the same as reporting research in maritime archaeology in Portugal, for a matter of expedience elected the latter, leaving the former for another time. The Portuguese discoveries and expansion did not arrive to a void, but came into contact with other cultures, rich in history, skilled labour and knowledge, as is the case of India. Technological innovation was traded, borrowed or stolen without regard to ideology or religion. Foreign habits became fashion in Portuguese society, then tradition, the same for Portuguese habits in other cultures. Nowadays no researchers deny that understanding Portuguese history is impossible without looking at a wider context. The case of the frigate *Santo Antonio de Tanná* well illustrates a reality present in the minds of Portuguese research, presently in finishing stages by a joint effort INA-CHAM. This ship was built in India, by Indian labour, under the indirect supervision of the Portuguese, crewed by a mix of Portuguese, Asian and African persons (Piercy, 1980). Many examples of this are possible, however one stands out in the realm of maritime archaeology, the first Asia Europe workshop held in Portugal, chosen because of its transcultural and interdisciplinary character. Organized by Jean-Yves Blot, it was a meeting of historians, archaeologists, naval engineers and linguists. These types of endeavours are examples to follow.

Conclusions

Research projects currently under development in maritime archaeology are based upon a series of pressing problematic for the construction of Portuguese history. The majority was precociously developed through traditional historiography. Archaeology, however, gave them a decisive contribution. One thematic is coastal knowledge within research

questions of coastal archaeology and maritime cultural landscape. This type has enriched the traditionalist view of underwater cultural charts and shoreline study. In the vanguard is the Cascais' project, studying underwater cultural heritage as testimony of life's experiences of local communities in a holistic view of the region, its heritage and identity. The multiple perspectives of the coast integrate dissimilar data as oral traditions, folklore, and the environment's evolution in the long term cognitive local perception. This vision of Human and the Sea shapes maritime culture study in an approximation, seen in a network of direct and indirect relationships between land and maritime structures. Thus archaeology expands around wider and productive topics in the field of Portuguese history. It is hoped that some of the archaeological heritage surveys recently launched might include this integrated and comprehensive view. Another rather relevant subject is port studies, at times associated to river and estuary research. The Portuguese port cities were subject to in numerous changes across the centuries, being especially true for the 20th century, when occur profound alterations to riverine environments. Expansion and modernization of harbours led to change in secular landscapes, although it also presented an opportunity for archaeological discoveries. Thus, research developed by maritime archaeology has been decisive in the approach to port city studies. Mention must be made of studies in estuaries such as Vouga, Arade, Sado, besides Cascais port, not far from Tejo, and the Angra and Horta bays in Azores archipelago. Moreover it is very likely that data coming from rescue archaeology can become part of or begin research projects. The cases of Lisbon and the Tejo's estuary are paradigmatic in this scope. Maritime archaeology is equally decisive in ship's studies and history of shipbuilding. In a country of a secular maritime tradition and identity plus a history spread outwards overseas, understanding the technologies allowing for those policies, means of transport and communication. The study of Portuguese ship design has origins reaching two centuries, but always based in written and iconographic sources. Archaeology has allowed a substantial development of this field. The requests of lead naval scholars for archaeological sources had eco in the field, answers whose diversity, complexity and richness brought forward a new vision on the morphology, design and operation of Portuguese ships. These contributions also carried new interrogations, namely in the complex and diverse world of ships of Iberian-Atlantic tradition, embodying the modern era maritime expansion. The lack of information is even larger regarding ships of the medieval period. Furthermore, it is conspicuously absent studies in iron shipbuilding. Projects like Aveiro, Angra and Faro are currently working those unknowns. Furthermore this is an area where research has, more than ever, to be open to world scientific debate.

Finally, good prospects in regard to issues of trade and shipboard life are opening up within maritime archaeology. In one side, discovered artefacts seem to evidence the importance of commerce routes and product circulation, previously unknown or ignored. On the other, it is evident archaeology's preference for the daily life, that vulgar continuity

often ignored by written testimonies. It's a well established fact, that vessels are great universes as a sample to the societies which manufactured and utilized them. Being evident that in this context underwater cultural heritage is inseparable of land archaeology. Of the described projects, Aveiro and Angra are relevant to this problematic, but every single one inevitably utilizes land archaeology as that data is essential for understanding archaeological contexts. Anyway, it is unquestionable that maritime archaeology is implemented in Portugal, in our opinion definitely. Experiencing different models, initially with greater state participation now developing mainly in academia, through moments of greater financial support and others of economic difficulty, it is unquestionable a group of people with expertise in this area be created in Portugal, to develop quality projects. The wants are still there, but we are certain that it is an area that we hope will be increasingly worked into an international context.

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References

- Allan, J., and Barber, J., 1992. A seventeenth century pottery group from Kitto Institute. In D. Gaimster and M. Redknapp (Eds.), *Everyday and Exotic Pottery from Europe. Studies in honour of John G. Hurst*, Oxbow Books, Oxford: 225-245.
- Alonso, H. C., 2003. El comercio del hierro Vasco través de los seguros marítimos burgaleses (1565-1596). *ITSAS Memoria. Revista de Estudos Marítimos del País Vasco*, Vol. 4: 165-192.
- Alves, F., and Ventura, P., 2005. Relatório da intervenção arqueológica de emergência no sítio dos destroços do navio do século XIV/XV Ria de Aveiro G, Available at Direcção Geral do Património Cultural, Lisboa, (Unpublished Report).
- Alves, F., 2002. O desenvolvimento da arqueologia subaquática em Portugal: Uma leitura. *Revista da Associação dos Arqueólogos Portugueses*, Vol. 54: 255 - 260.
- Alves, F., Machado, A., and Castro, L. F. V., 2002. Projecto ProArade. Relatório da campanha de 2001, Available at Direcção Geral do Património Cultural, Lisbon.
- Alves, F., (Ed.), 2001. *Proceedings International Symposium on Archaeological of Medieval and Modern Ships of Iberian-Atlantic Tradition*. Instituto Português de Arqueologia, Lisboa.
- Alves, F., Rieth, E., Rodrigues, P. J., Aleluia, M., Rodrigo, R., Garcia, C., and Riccardi, E., 2001a. The hull remains of Ria de Aveiro A, a mid-15th century shipwreck from Portugal: a preliminary analysis. In F. Alves (Ed.), *Proceedings International Symposium on Archaeological of Medieval and Modern Ships of Iberian-Atlantic Tradition*, Instituto Português de Arqueologia, Lisboa: 317-345.
- Alves, F., Rieth, E., and Rodrigues, P. J., 2001b. The remains of a 14th century shipwreck at Corpo Santo and of a shipyard at Praça do Município, Lisbon, Portugal. In F. Alves (Ed.), *Proceedings*

- International Symposium on Archaeological of Medieval and Modern Ships of Iberian-Atlantic Tradition*, Instituto Português de Arqueologia, Lisboa: 405-426.
- Alves, F., Rodrigues, P. J., Aleluia, M., Rodrigo, R., Garcia, A. C., Rieth, E., and Riccardi, E., 2001c. Ria de Aveiro A: a shipwreck from Portugal dating to the mid-15th century; a preliminary report. *International Journal of Nautical Archaeology*, Vol. 30 (1): 12-36.
- Alves, F., Paulo, R., Garcia, C., and Aleluia, M., 1998. Cerâmica dos destroços do navio de meados do século XV Ria de Aveiro e zona da Ria de Aveiro B. Aproximação tipológica preliminary. In J. M. D. Diogo and H. C. Abraços (Eds.), *Actas das 2as Jornadas de Cerâmica Medieval e Pós Medieval: métodos e resultados para o seu estudo, Tondela, 1995*, Câmara Municipal de Tondela, Tondela: 185-210.
- Alves, F., 1997a. Em Torno dos Projectos da Boca do Rio e do Oceán. *Setúbal Arqueológica*, Vol. 11-12: 225-239.
- Alves, F., 1997b. Ponta do Altar B - Arqueologia de um naufrágio no Algarve nos alvares do século XVII. *O Arqueólogo Português*, Vol. 8-10: 357-424.
- Alves, F., 1992. O itinerário arqueológico subaquático do Oceán. *O Arqueólogo Português*, Vol. 8-10: 455-467.
- Alves, F., 1990. A arqueologia subaquática em Portugal. Uma Questão inadiável. *Memórias da Academia de Marinha*, Vol. 19: (Sep).
- Amorim, I., 2008. *Porto de Aveiro: Entre a Terra e o Mar*. Administração do Porto, S.A, Aveiro.
- Amorim, I., 1997. *Aveiro e a sua Provedoria no século XVIII (1690-1814), estudo económico de um espaço historic*, Comissão de Coordenação da Região Centro, Coimbra.
- Barbosa, P. G., 1993. O porto de Lagos no final da Idade Média: algumas reflexões. *Cadernos Históricos*, Vol. IV: 15-26.
- Bass, G., 2011. The Development of Maritime Archaeology. In A. Catsambis, B. Ford and D. L. Hamilton (Eds.), *The Oxford Handbook of Maritime Archaeology*, Oxford University Press, New York: 3 - 22.
- Bettencourt, J., and Carvalho, P., 2011. A história submersa na baía da Horta: resultados preliminares dos trabalhos arqueológicos no 'naufrágio do marfim' (primeiro quartel do século XVIII). In N. C. D. Horta (Ed.), *O Faial e a periferia Açoriana nos séculos XV a XX. (Actas do V Colóquio, realizado em Maio de 2010 nas ilhas do Faial e de São Jorge)*, Núcleo Cultural da Horta, Horta: 139-153.
- Bettencourt, J., 2009. Arqueologia marítima da Ria de Aveiro: uma revisão dos dados disponíveis. In Â. Garrido and F. Alves (Eds.), *Actas do Colóquio Octávio Lixa Filgueiras. Arquitecto de Culturas Marítimas*, Âncora Editora, Lisboa: 137-160.
- Bettencourt, J., and Carvalho, P., 2009. Arqueologia marítima na baía de Angra (Angra do Heroísmo, Terceira): enquadramento e resultados preliminares do projecto PIAS. *Arqueologia Moderna e Contemporânea*, Vol. 1: 70-91.
- Bettencourt, J., Carvalho, P., and Fonseca, C., 2009. The PIAS Project (Terceira Island, Azores, Portugal). Preliminary results of a historical-archaeological study of a transatlantic port of call. *Skyllis - Zeitschrift für Unterwasserarchäologie*, Vol. 1: 62-71.
- Bettencourt, J., and Carvalho, A., 2008. A carga do navio Ria de Aveiro A (Ílhavo), Portugal: Uma aproximação preliminar ao seu significado histórico-cultural. In Centro de estudios Borjanos (Ed.), *Actas de la 13 Reunion internacional de historia de la Nautica y de la hidrografia. Cadernos de estudios borjanos*, Borgia: 257-287.

- Bettencourt, J. A., Caleja, P., and Carvalho, P., 2007. Novos dados sobre o sítio Ponta do Altar B (Lagoa): um naufrágio da primeira metade do século XVII na embocadura do Rio Arade. *Xelb*, Vol. 8: 333-350.
- Bettencourt, J., Carvalho, P., and Fonseca, C., 2006a. Project PIAS: resultados dos trabalhos de 2006, *Al-madan*, electronic addenda n. 14. Almada. [[http://almadan.cidadevirtual.pt/AdendaElectronica%20\(geral\).htm](http://almadan.cidadevirtual.pt/AdendaElectronica%20(geral).htm).]
- Bettencourt, J., Carvalho, P., Caleja, P., and Alves, F., 2006b. O sítio arqueológico subaquático Arade B. *Xelb*, Vol. 6: 257-274.
- Bettencourt, J., 2006. Os vestígios da nau Nossa Senhora da Luz. Resultados dos trabalhos arqueológicos. *Arquipélago (historia)*, Vol. 9-10: 231-273.
- Blot, J.-Y., Dias Diogo, A., Almeida, M. J., Venâncio, R., Veriya, Y., Maricato, C., Russo, J., Bombico, S., Frazão, V., Amato, A., Bartolo, M. D., Almeida, P., Blot, M. L. P., Coelho, J., Lucena, A., Ruas, J. P. and Jorge, L. S., 2006. O sítio submarino dos Cortiçais (costa meridional da antiga ilha de Peniche). In R. Venâncio (Ed.), *Actas Ias Jornadas de Arqueologia e Património da Região de Peniche*, Câmara Municipal de Peniche, Peniche: 157-227.
- Blot, J.-Y., Fraga, T. M., Caleja, P., Bispo, J., Silva, J., Galvão, M., Worthington, A., Martins, R., Sasaki, R., Gonçalves, J., Coelho, R., Monteiro, P., Gonçalves, P., Tissot, I., and Tissot, M., 2005. Faro A, um sítio de naufrágio ao largo do Algarve, *Xelb*, Vol. 5: 283-304.
- Blot, M. L. P., 2003. *Os portos na origem dos centros urbanos*. Instituto Português de Arqueologia, Lisboa.
- Blot, J.-Y., 2002. New Courses in Maritime Archaeology in Portugal. In C. V. Ruppé and J. F. Barstand (Eds.), *International Handbook of Underwater Archaeology*, Kluwer Academic/Plenum, New York: 465 - 495.
- Blot, J.-Y., 1999. O Mar de Keith Muckelroy: O papel da teoria na arqueologia do mundo náutico. *Al-madan*, Vol. 8: 41-53.
- Blot, J.-Y., and Blot, M. L. P., 1991. Le naufrage du San Pedro de Alcantara. *La Research*, Vol. 230: 334-342.
- Caetano, C., 2004. *A Ribeira de Lisboa na época da expansão portuguesa (séculos XV a XVIII)*. Pandora, Lisboa.
- Carrapiço, J., Palhinha, J., and Brazio, J., 1974. *As Muralhas de Portimão, Subsídios para o Estudo da História Local*. Câmara Municipal de Portimão, Portimão.
- Castro, L. F. V. D., 2005. Arade River Archaeological Complex: Dredges and Archaeology. *International Journal of Nautical Archaeology*, Vol. 34 (1): 51 - 61.
- Castro, L. F. V. D., 2002a. *The Pepper wreck*. College Station, Texas.
- Castro, L. F. V. D., 2002b. *São Julião da Barra Archaeological Complex - Ship Lab Report 7*. Available at Nautical Archaeological Program Library, Texas A&M University.
- Castro, L. F. V. D., Labrincha, J., and Alves, F., 1998. Physical and chemical characterisation of archaeological ceramics found in a mid-15th century shipwreck in Ria de Aveiro. In L. Faria and M. Ferreira (Eds.), *Conference on Materials in Oceanic Environment*, (Euromat'98, 22-24 July), Organizing Committee of the Conference, Lisbon: 223-232.
- Coelho, I. P., and Coelho, J., 2012. A cerâmica do sítio arqueológico Ria de Aveiro B-C: análise e conservação. In J. Cascalheira and C. Gonçalves (Eds.), *Actas das IV Jornadas de Jovens em Investigação Arqueológica - JIA 2011*, Núcleo de Arqueologia e Paleoecologia, Departamento de Artes e Humanidades, Faro: 141-148.

- Coelho, I. P., 2009. A cerâmica do sítio arqueológico Ria de Aveiro B-C: tipologias e significado histórico-cultural. In Â. Garrido and F. Alves (Eds.), *Actas do Colóquio Octávio Lixa Filgueiras. Arquitecto de Culturas Marítimas*, Âncora Editora, Aveiro: 163-186.
- Coelho, A. B., 1991. Introdução. In R. M. Paula (Ed.), *Lagos, Evolução Urbana e Património*, Câmara Municipal de Lagos, Lagos: IX-XX.
- Coelho, A. B., 1989. *Portugal na Espanha Árabe*. Seara Nova, Lisboa.
- Corrochano, A., Merino, S. G., Barba, P. and Bernardes, C., 2000. Los sedimentos del canal mareal de Mira (Aveiro, Portugal): propiedades texturales, procedencia y modelo paleogeográfico. *Studia Geologica Salmanticensia*, Vol. 36: 143-160.
- Costa, L., 2002. *O transporte Atlântico e a Companhia Geral do Comércio do Brasil (1580-1663)*. Comissão Nacional para as Comemorações dos Descobrimentos Portugueses, Lisboa.
- Costa, L. F., 1997. *Naus e Galeões na Ribeira de Lisboa: a construção naval no século XVI para a Rota do Cabo*. Patrimónia, Cascais.
- Crisman, K., and Garcia, C., 2001. The Shipwrecks of Angra Bay, 2000-2001. *INA Quarterly*, Vol. 28 (4): 3-11.
- Domingues, F. C., 2004. *Os Navios do Mar Oceano*. Centro de História da Universidade de Lisboa, Lisboa.
- Domingues, F. C., 2003. *Arqueologia Naval Portuguesa (séculos XV e XVI). História, conceito, bibliografia*. Edições Culturais da Marinha, Lisboa.
- Domingues, F. C., 1985. *Experiência e conhecimento na construção naval portuguesa do século XVI: os tratados de Fernando Oliveira*. IICT/ CEHCA, Lisboa.
- Esparteiro, A. M., 1987. *Três Séculos no Mar 1640-1910*. Ministério da Marinha, Lisboa.
- Filgueiras, O. L., (Ed.), 1988. *Boat and Ship Archaeology: Local boats 4th International Symposium Proceedings*. British Archaeological Reports, Oxford.
- Fonseca, C., 2006. A Equipa de Arqueologia Subaquática do Museu Municipal de Portimão: Balanço de Dois Anos de Actividade e Perspectivas Futuras. *Xelb*, Vol. 6: 125-138.
- Fonseca, C., 2005. *Intervenção no Arqueossítio Subaquático GEO 5*, Available at Câmara Municipal de Portimão, Portimão, (Unpublished Report).
- Ford, B., 2011. Coastal Archaeology. In A. Catsambis, B. Ford and D. L. Hamilton (Eds.), *The Oxford Handbook of Maritime Archaeology*, Oxford University Press, New York: 763-785.
- Fraga, T. M., and Teixeira, A., 2012. Projecto N-utopia - Projecto Tratados, Nomenclaturas Náuticas e Construções Navais Europeias. In J. Cascalheira and C. Gonçalves (Eds.), *Actas das IV Jornadas de Jovens em Arqueologia - JIA 2012*, Universidade do Algarve, Faro: 33-37.
- Fraga, T. M., and Martins, A. S., 2011. Lagos D wreck. *Nautical Archaeology Society Newsletter*, (Winter) No. 11.
- Fraga, T. M., Marreiros, J., and Jesus, L. D., 2008. *Contos inacabados: A história submersa de Lagos*. Câmara Municipal de Lagos, Lagos.
- Freire, J., Bettencourt, J., and Fialho, A., 2012a. ProCASC - Estudo, valorização e monitorização do complexo Arqueológico Subaquático de São Julião da Barra/Carcavelos - relatório dos trabalhos de 2011, Available at Centro de História Além-Mar, Cascais, (Unpublished Report).
- Freire, J., Bettencourt, J., and Fialho, A., 2012b. Sistemas de Informação Geográfica na gestão do Património Cultural Subaquático: a experiência da Carta Arqueológica Subaquática de Cascais. In I. Hidrográfico (Ed.), *2as Jornadas de Engenharia Hidrográfica*, Instituto Hidrográfico, Lisboa: 365-368.

- Freire, J., and Fialho, A., 2011. Relatório do Projecto: Carta Arqueológica Subaquática de Cascais do Ano 2011, Available at Centro de História Além-Mar, Lisboa, (Unpublished Report).
- Freire, J., and Fialho, A., 2009. Relatório do Projecto: Carta Arqueológica Subaquática de Cascais do Ano 2009, Available at Centro de História Além-Mar, Lisboa, (Unpublished Report).
- Freire, J., Blot, J.-Y., Vieites, A., Fialho, A., and Reicherd, F., 2009. Missão de avaliação e levantamento do sítio submarino do clipper Thermopylae. *Revista Portuguesa de Arqueologia*, Vol. 12 (1): 221-244.
- Freire, J., and Russo, J., 2004. Vale de Frades um sítio arqueológico subaquático. In N. Bicho (Ed.), *História, Teoria e Método da Arqueologia, Actas do IV Congresso de Arqueologia Peninsular, Universidade do Algarve*, Promontório Monográfica, Faro: 145-155.
- Garcia, A. C., 2005. Campanha de Carta Arqueológica Subaquática da Baía de Angra do Heroísmo: Relatório final - 2004, Available at Direcção Regional de Cultura, Angra do Heroísmo, (Unpublished Report).
- Garcia, C., and Monteiro, P., 2001. The excavation and dismantling of Angra D, a probable Iberian seagoing ship, Angra bay, Terceira Island, Azores, Portugal. In F. Alves (Ed.), *Proceedings International Symposium of Archaeological of Medieval and Modern Ship of Iberian-Atlantic Tradition: Hull remains, manuscripts and ethnographic sources: a comparative approach*, Instituto Português de Arqueologia, Lisboa: 431 - 447.
- Garcia, C., Monteiro, P. A., and Phaneu, E., 1999. Os destroços dos navios Angra C e D descobertos durante a intervenção arqueológica subaquática realizada no quadro do projecto de construção de uma marina na baía de Angra do Heroísmo. *Revista Portuguesa de Arqueologia*, Vol. 2 (2): 211-232.
- Garrido, Á., and Alves, F., 2009. Actas do Colóquio Octávio Lixa Filgueiras. Arquitecto de Culturas Marítimas, *Colóquio Octávio Lixa Filgueiras. Arquitecto de Culturas Marítimas*, Âncora editora, Ílhavo.
- Gomes, M. V., Cardoso, J. L., and Alves, F., 1995. *Levantamento arqueológico do Algarve: concelho de Lagoa*. Câmara Municipal de Lagoa, Lagoa.
- Huxley, M. B., 2003. El comercio marítimo y guipuscoano com el Atlántico peninsular (Astúrias, Galicia, Portugal y Andalucía) y com los archipiélagos de Canarias y Madeira al principio de la Edad Moderna. *ITSAS Memoria. Revista de Estudos Marítimos del País Vasco*, Vol. 4: 147-167.
- Infantini, L., and Poloni, R., 2010. Authoritarianism and Archaeology in Portugal. *Present Pasts*, Vol. 2 (1): 194-208.
- Kermorvant, A., Romero, S., and Prat, F., 1990. Desarrollo de una técnica de detección geofísica aplicada a la exploración arqueológica de medios húmedos e subacuáticos. *Geociências*, Vol. 5 (1): 123-134.
- Leitão, M., and Simões, F., 2002. *D. Fernando II e Glória - Restauro e Recuperação* Lisboa, Edições Culturais da Marinha, Lisboa.
- Loureiro, R. M., 2008. *Lagos e os Descobrimentos até 1540*. Câmara Municipal de Lagos, Lagos.
- Loureiro, V., and Alves, G. A., 2008. The Arade 1 Shipwreck: Preliminary Results of the 2004 and 2005 Field Seasons. *International Journal of Nautical Archaeology*, Vol. 37 (2): 273-282.
- Machado, C. A., 2001. Relatório Final do Projecto Salvaguarda do Património Arqueológico Subaquático do Rio Arade - Portimão, Available at Grupo de Estudos Oceânicos, Portimão, (Unpublished Report).
- Macleod, I. D., and Schindelholz, E., 2004. Surface analysis of corroded silver coins from the wreck of the San Pedro De Alcantara (1786). In J. Ashton and D. Hallam (Eds.), *Proceedings of Metal 2004*, National Museum of Australia, Canberra: 114-125.

- Mantas, V. G. S., 2003. Portos marítimos romanos. *Memórias da Academia de Marinha*, Vol. VIII: 5-69.
- Mantas, V. G. S., 1996. Comércio marítimo e sociedade nos portos romanos do Tejo e do Sado. In G. Filipe, J. M. C. Raposo and C. M. D. Seixal (Eds.), *Ocupação romana dos estuários do Tejo e do Sado : actas das Primeiras Jornadas sobre Romanizac dos Estuários do Tejo e do Sado*, Câmara Municipal do Seixal and Publicações Dom Quixote, Lisboa: 343-369.
- Mantas, V. G. S., 1990. As cidades marítimas da Lusitânia. In J.-G. Gorges (Ed.), *Les ville de la Lusitanie Romaine*, CNRS, Paris: 149-205.
- Mantas, V. G. S., 1998. Tecnologia Naval Romana. *Memórias da Academia de Marinha*, Vol. X: 5-59.
- Martins, A. S., 2001. *A Arqueologia Naval Portuguesa (Séculos XIII-XVI)*. Universidade Autónoma de Lisboa, Lisboa.
- Matos, A. T., 2005. *A Colonização Atlântico*. Editorial Estampa, Lisboa.
- Monteiro, A. S., 1993. *A evolução do pensamento naval português*. Academia de Marinha, Lisboa.
- Monteiro, A. S., 1997. *Batalhas e Combates da Marinha Portuguesa*, 8 Vols, Sá da Costa editora, Lisboa.
- Monteiro, P. A., and Pinheiro, S., 2012. O Naufrágio da Nau Nuestra Senora del Rosario (Troia, 1589). *Al-madan*, Vol. 17: 147 - 159.
- Morán, E., 2003. Projecto Arade - Balanço dos Resultados e perspectivas de Trabalho. *Xelb*, Vol. 4: 325-334.
- Muckelroy, K., 1978. *Maritime Archaeology*. Cambridge University Press, Cambridge.
- Muckelroy, K., 1975. A systematic Approach to the Investigation of Scattered wreck sites. *International Journal of Nautical Archaeology*, Vol. 4 (2): 137-190.
- Oertling, T., 2005. Characteristics of Fifteenth and Sixteenth-Century Iberian Ships. In F. M. Hocker and A. Ward (Eds.), *The Philosophy of Shipbuilding*, Texas A&M Press, College Station: 129-136.
- Oertling, T., 2001. The Concept of the Atlantic Vessel. In F. Alves (Ed.), *Proceedings International Symposium on Archaeological of Medieval and Modern Ships of Iberian-Atlantic Tradition*, Instituto Português de Arqueologia, Lisboa: 213-228.
- Pedrosa, F. G., 2005. *O declínio do poder naval português: A Marinha, o Corso e a Pesca nos inícios do Século XVII*. Câmara Municipal de Cascais, Cascais.
- Pedrosa, F. G., 2002. *Algumas prováveis inovações de origem portuguesa das técnicas e táticas navais durante a expansão marítima*. Câmara Municipal de Cascais, Cascais.
- Pedrosa, F. G., 1997. *História da Marinha Portuguesa: Navios, Marinheiros e Arte de Navegar, 1139 - 1449*. Academia de Marinha, Lisboa.
- Pereira, J. A. R., 2010. *Marinha Portuguesa: Nove Séculos de História*. Comissão Cultural de Marinha, Lisboa.
- Pereira, J. A. R., 2005. *Campanhas Navais: A Marinha Portuguesa na Época de Napoleão*. Câmara Municipal de Cascais, Lisboa.
- Piercy, R., 1981. Mombasa wreck Excavation. Fourth Preliminary Report, 1980. *International Journal of Nautical and Underwater Archaeology* Vol. 10 (2): 109-118.
- Pinheiro, L. M., Almeida, F., Bernardes, C., Alves, F., and Teixeira, F. C., 1998. Geofísica e estratigrafia geológica do sítio dos destroços do navio dos meados do século XV Ria de Aveiro A in 5º Congresso Nacional de Geologia, Instituto Geológico e Mineiro, Lisboa: C40-C50.
- Rahn-Philips, C., 1992. *Six Galleons for the King of Spain: Imperial Defence in the Early Seventeenth Century*. John Hopkins University Press, London.

- Rambelli, G., Callipo, F., and Camargo, P., 2003. Participação brasileira na campanha de arqueologia subaquática do projecto Arade (ProArade) 2002, Available at Museu de Arqueologia e Etnologia da Universidade de São Paulo, São Paulo, (Unpublished Report).
- Rodrigues, P. J., Alves, F., Rieth, E., and Castro, L. F. V. D., 2001. L'épave dun navire de la moitié du XV.ème siècle / début du XVI.ème, trouvée au Cais do Sodré (Lisbonne). Note Préliminaire. In F. Alves (Ed.), *Proceedings International Symposium on Archaeological of Medieval and Modern Ships of Iberian-Atlantic Tradition*, Instituto Português de Arqueologia, Lisboa: 347 - 380.
- Russo, J., 2005. GEPS, uma Associação arqueológica de Peniche. In R. Venâncio (Ed.), *Atas das Ias Jornadas de Arqueologia e Património da Região de Peniche*, Câmara Municipal de Peniche, Peniche: 8-13.
- Salgado, A. A., 2004. *Os navios de Portugal na Grande Armada. O poder naval português 1574-1592*, Prefácio, Lisboa.
- Salgado, A. A., 2001. Seis galeões DA coroa de Portugal para Filipe II.
- Santos, N. V. D., 1991. *Apontamentos para a história da Marinha Portuguesa*. Academia de Marinha, Lisboa.
- Sarrazola, A., Silva, I., Coelho, M., and Merlro, S., 2001. Intervenções arqueológicas na Marinha Baixa (Cacia, Aveiro). Resultados preliminares. *ERA Arqueologia*, Issue 3 (Jul 2001): 24-40.
- Serrano Mangas, F., 1985. *Los galeones de la Carrera de Indias, 1650-1700*. Escuela de Estudios Hispano-Americanos de Sevilla, Sevilla.
- Silva, A. M. S. P., 1987. Cerâmica tradicional na região de Aveiro: alguns elementos fundamentais. *Olaria*, Vol. 1: 53-77.
- Silva, M., 1991. *Aveiro Medieval*. Câmara Municipal de Aveiro, Aveiro.
- Simplício, M. C., and Barros, P., 1999-2000. Quarteira Submersa: resultados da campanha de 1998. *Al-íulyã - Revista do Arquivo Histórico Municipal de Loulé*, Vol. 7: 55 - 76.
- Simplício, M. C., Barros, P. F., and Garcia, A. C., 1999. Prospecções Arqueológicas no Rio Guadiana: Porto de Mértola. *Al-madan*, Vol. 8: 54-62.
- Simplício, M. C., Teixeira, S., and Barros, P., 2002. Arqueologia e geodinâmica do Litoral - o caso de Quarteira (Algarve - Portugal), in ADECAP (Ed.), *3º Congresso de Arqueologia Peninsular - Actas*, ADECAP, Braga: 609 - 622.
- Telo, A. J., 1991. *História da Marinha Portuguesa: Homens, Doutrinas e Organização, 1824-1974*. Academia de Marinha, Lisboa.
- Westerdahl, C., 2011. Conclusion: The Maritime Cultural Landscapes revisited. In B. Ford (Ed.), *The archaeology of maritime landscapes*, Springer, New York: 331-344.



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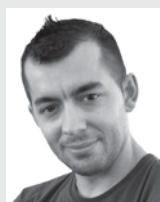
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The importance of marine archaeology in India has coincided with the increasing visibility of maritime history. This has contributed to changing the perspective of the history of the sub-continent, from the land-locked history of the northern plain to incorporating the view from the peninsula. The study of the Indian Ocean becomes inevitable. The recognisable changes in maritime history relate to the economy of trade and the technology involved. In both these areas maritime archaeology provides data. Shipwrecks can confirm evidence on the volume of trade and the items traded. Ships' timbers, cloth fragments, cargoes, tell their own story. Viewed from the Indian peninsula, the span of the Indian Ocean trade went from West Asia to South-east Asia, initially dependent on the monsoon winds, until the technology of ship-building overcame this. Eventually this trade linked Tunis, Egypt, the Red Sea, India, South-east Asia and southern China. The Afro-Asian maritime links were a counterpart to the land-based Silk Road. The inter-dependence of economies and of settlements is striking. European enterprise, though a late arrival, changed the economy of Asia. The papers in this book refer to many parts of the world, and many aspects of maritime history and shipwrecks. It therefore makes a fine and illuminating introduction to marine archaeology as a historical source.

—Romila Thapar, Professor Emerita of History, Jawaharlal Nehru University, New Delhi



In *'Shipwrecks around the World: Revelations of the past'*, volume Sila Tripathi has gathered a sterling assemblage of authors who cover maritime archaeological subjects that span the globe from the North Atlantic to the Indian Ocean, from the South Atlantic to the Pacific, and seas too numerous to name individually. Similarly, the myriad countries from New Zealand to Namibia, from Bahrain to Brazil, from Australia to Sweden are far too many to list. I know of no other work that offers such a broad geographical range of topics related to this relatively new field of research. Not only are specific shipwrecks described and interpreted by their excavators in this exceptional collection, but some of the world's leading practitioners discuss subjects as diverse as ceramics, hull construction, conservation, wood identification, depictions of watercraft, anchors, localized rigging, maritime trade, naval warfare, and ports and harbours. In addition there are essays on the state of maritime archaeology in particular locales, from Korea to Sri Lanka to Spain and France, as well as on the past and future of the field of maritime archaeology in general, and the role of laws to protect our underwater cultural heritage. The chapters I have read in advance of publication compel me to offer heartiest congratulations to Sila Tripathi for putting together this unique reference.

—George F. Bass, Institute of Nautical Archaeology at Texas A&M University



'Shipwrecks around the World: Revelations of the past', is a collection of papers from some of the world's leading maritime archaeologists. In all, 35 papers on maritime archaeology and maritime trade from around the world. This publication will be an important contribution to the study of maritime archaeology of the world. The subject is becoming popular in India where many universities and research institutions are becoming involved in the field. This volume is intended to provide the latest information for Indian as well scholars and students of other countries. The Marine Archaeology Centre of the CSIR-National Institute of Oceanography in Goa has an impressive publication record with papers published in *Journal of Archaeological Science*, *Antiquity*, *World Archaeology*, *International Journal of Nautical Archaeology*, *Current Science*, *Bulletin of the Australian Institute for Maritime Archaeology*, *International Journal of Maritime History*, *Man and Environment* and *Mariner's Mirror*. In addition, the Centre has published a number of books on maritime archaeological subjects relating to shipwrecks and archaeological sites in Indian waters. This is an impressive record and to be commended. Maritime archaeology is a relatively new discipline, but is growing and expanding as an academic subject. Publications such as this will help to develop the field and ensure that underwater cultural heritage is preserved and protected.

—Jeremy Green, Western Australian Maritime Museum, Fremantle, Western Australia



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